TRC

Certificate of Compliance

Training Research Co., Ltd.

hereby certifies that

R&TTE DIRECTIVE

RISC-based Ready-to-Run Wireless Embedded Computer
Model: ThinkCore W341-LX

Made by

Moxa Technologies Co., Ltd.
Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C.

is fulfilled (As detailed within the test report)

Art.3.1 b) ETSI EN 301 489-1 V1.5.1/2004-11, ETSI EN 301 489-17 V1.2.1/2002-04
Art.3.2 a) ETSI EN 301 893 V1.3.1/2005-08
Art.3.2 a) ETSI EN 300 328 V1.6.1/2004-11
EN50392: 2004

Test Date: May 04, 2007
Certificate Registration No.: M47ET060805

May 10, 2007

Frank Tsai

General Manager, Frank Tsai

CE ! CE ! CE ! CE ! CE !

Nemko Laboratory Authorisation Aut. No.: ELA 131

R&TTE
Technical Construction File

Product description:

RISC-based Ready-to-Run Wireless Embedded Computer

Applicant:

Moxa Technologies Co., Ltd.

Manufacture:

Moxa Technologies Co., Ltd.

Brand:

Moxa

Type/model number:

ThinkCore W341-LX

Technical Construction file in accordance with R&TTE AnnexIII

Under the provisions if Annex III point 2 of the **R&TTE directive 1999/5/EC** of the European Parliament and of the council of 9 March on Radio equipment and Telecommunications Terminal Equipment (R&TTE directive) and the mutual recognition of their conformity,

We, the undersigned,

Company	Moxa Technologies Co., Ltd.
Address, City	Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City,
Country	Taipei, Taiwan, R.O.C.
Phone number	886-2-8919-1230
Fax number	886-2-8919-1231
E-mail	Jack_Shi@moxa.com.tw

Have established a Technical Construction File as specified below to be inspected to any Member States and to be kept available to the relevant national authorities of any Member State for inspection purpose:

Item number	**Technical Document description**
01	Technical File in accordance with R&TTE directive Annex II point 4
02	Declaration of conformity to specific test suites described in R&TTE directive Annex III

For the following product:

Product Description / Supplementary Info	RISC-based Ready-to-Run Wireless Embedded Computer
Manufacturer	Moxa Technologies Co., Ltd.
Brand	Moxa
Type	ThinkCore W341-LX

The Technical Construction File as specified above will be kept for a period ending at least 10 years after the last product has been manufactured at the disposal of the relevant national authorities of any Member State for inspection purpose,

Draw up in	Taiwan
Date	2007/05/24
	Moxa Technologies Co., Ltd. Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C.
Signature & company stamp	Jackie Shi / Manager

Technical Construction file in accordance with R&TTE Annex II Point 4

Under the provisions if Annex II point 4 of the **R&TTE directive 1999/5/EC** of the European Parliament and of the council of 9 March on Radio equipment and Telecommunications Terminal Equipment (R&TTE directive) and the mutual recognition of their conformity,

We, the undersigned,

Company	Moxa Technologies Co., Ltd.
Address, City	Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City,
Country	Taipei, Taiwan, R.O.C.
Phone number	886-2-8919-1230
Fax number	886-2-8919-1231
E-mail	Jack_Shi@moxa.com.tw

Have established a Technical Construction File as specified below to enable assessment of the product conformity with the essential requirements of the R&TTE directive:

Item number	**Technical Document description**
01	Block diagram
02a	Circuit diagram
02b	PCB layout
02c	Part list
02d	Exterior photographs
02e	Interior photographs
02f	Label information
03a	Technical description
03b	User manual
04	R&TTE standard list
05	RF-EMC-LVD-MPE test report and corresponding annexes
06	Copy of the R&TTE Declaration of Conformity (DOC)
07	Product Quality Assurance documents

For the following product:

Product Description / Supplementary Info	RISC-based Ready-to-Run Wireless Embedded Computer
Manufacturer	Moxa Technologies Co., Ltd.
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Type	ThinkCore W341-LX

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CE !

Draw up in	Taiwan
Date	2007/05/24
	Moxa Technologies Co., Ltd. Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C.
Signature & company stamp	Jackie Shi / Manager

ThinkCore W341
Wireless Embedded Computer
MOXA

USB
LAN
NO
COM
NC
Reset
MOXA

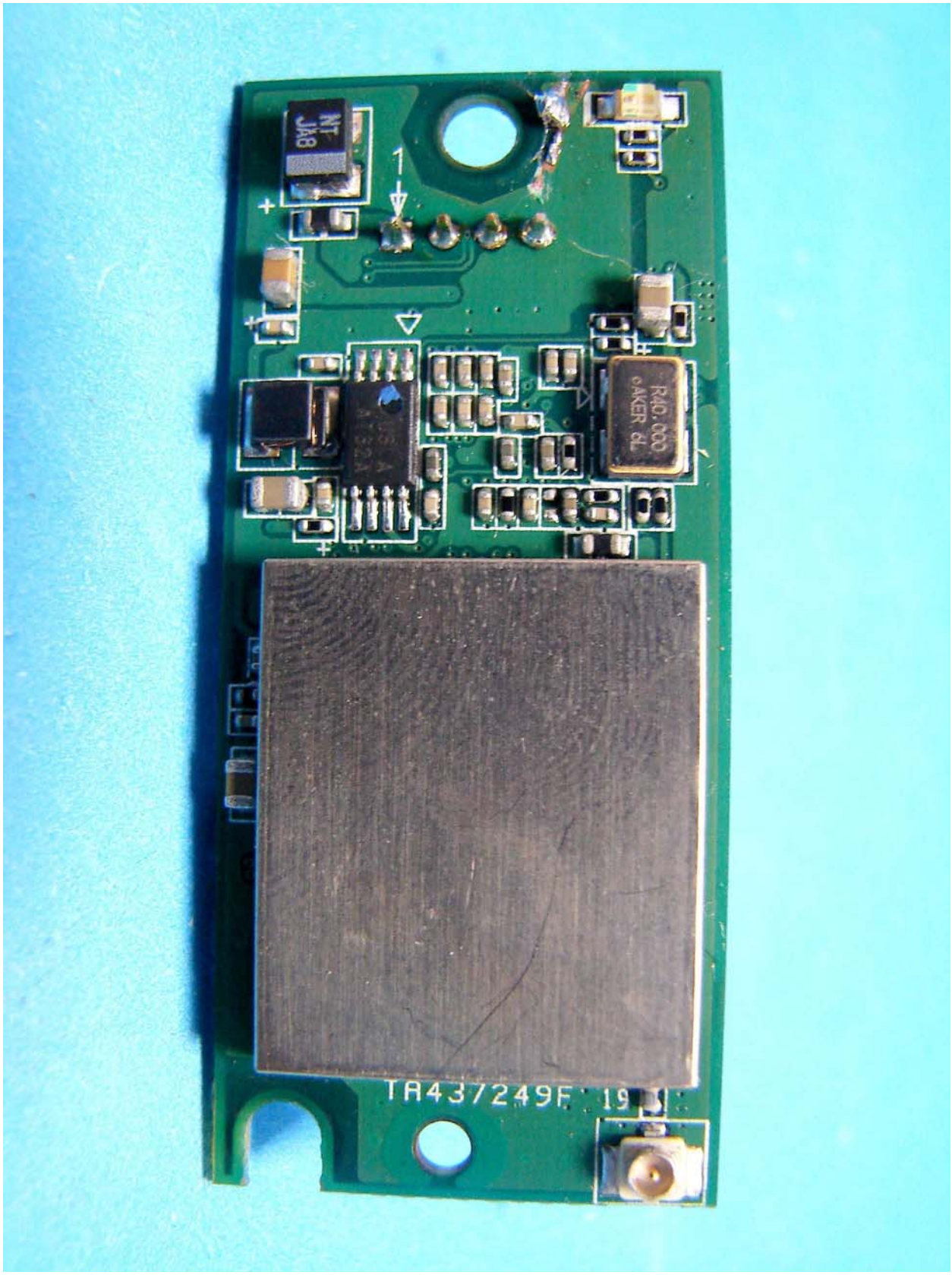
ThinkCore W341
MOXA
P1
RS-232/422/485
P2
P3
RS-232/422/485
P4

12-48V
Reset
NO
COM
NC
RELAY
LAN
USB

ThinkCore W341
Wireless Embedded Computer
Ready
P1 P2 P3 P4
Tx
Rx
WLAN
P1 P2 P3 P4
MOXA

BALANCE ELECTRONICS CO.,LTD.
MODEL: GPSA-1200125
INPUT(I/P) :100-240V~ 50-60Hz 0.5A
OUTPUT(O/P) :12V ⎓ 1.2A
CAUTION: RISK OF
ELECTRIC SHOCK DO NOT OPEN.
I.T.E. POWER SUPPLY
LPS
E221622
933150 V05474
MADE IN CHINA

6342
MOXA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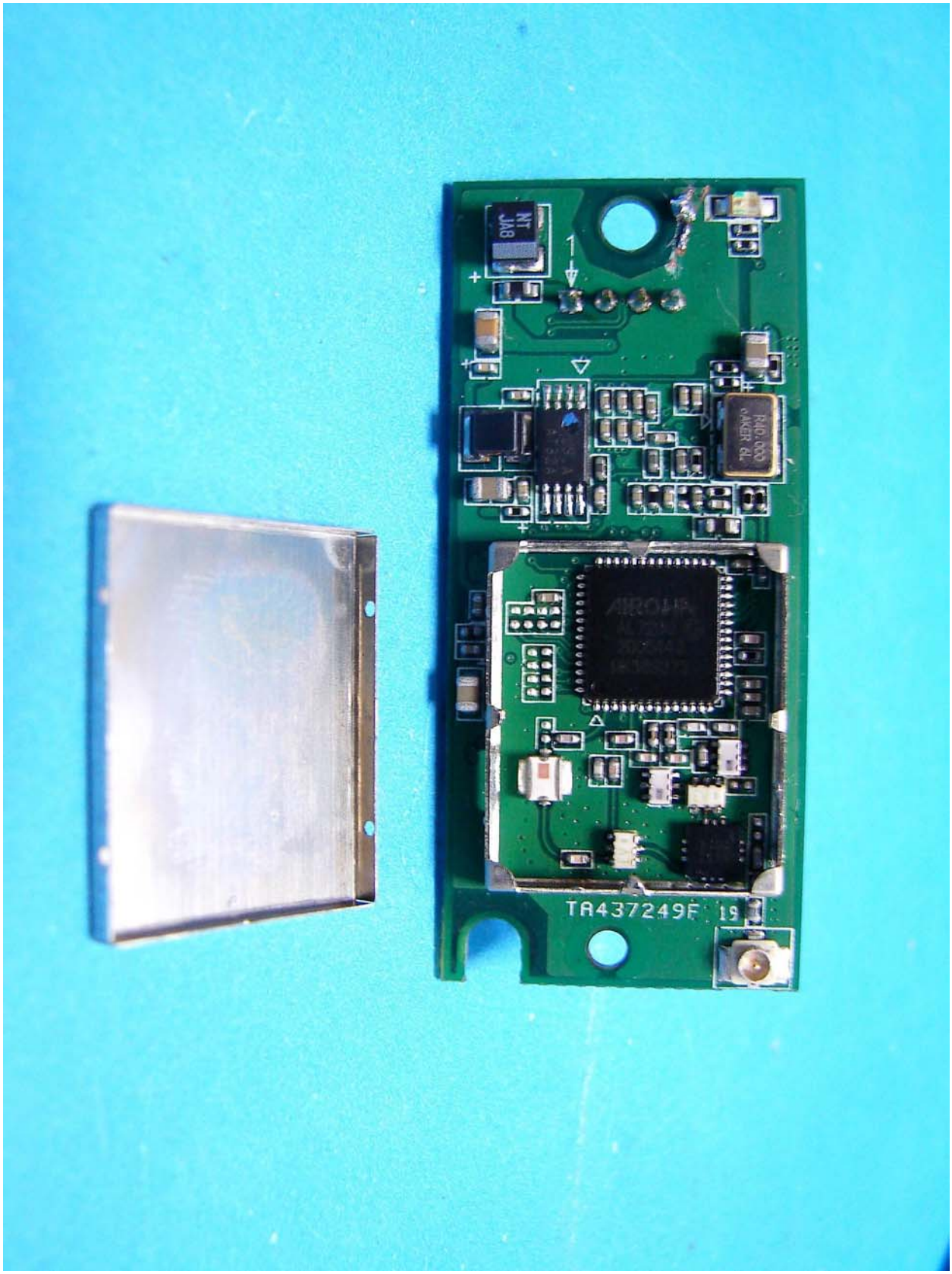
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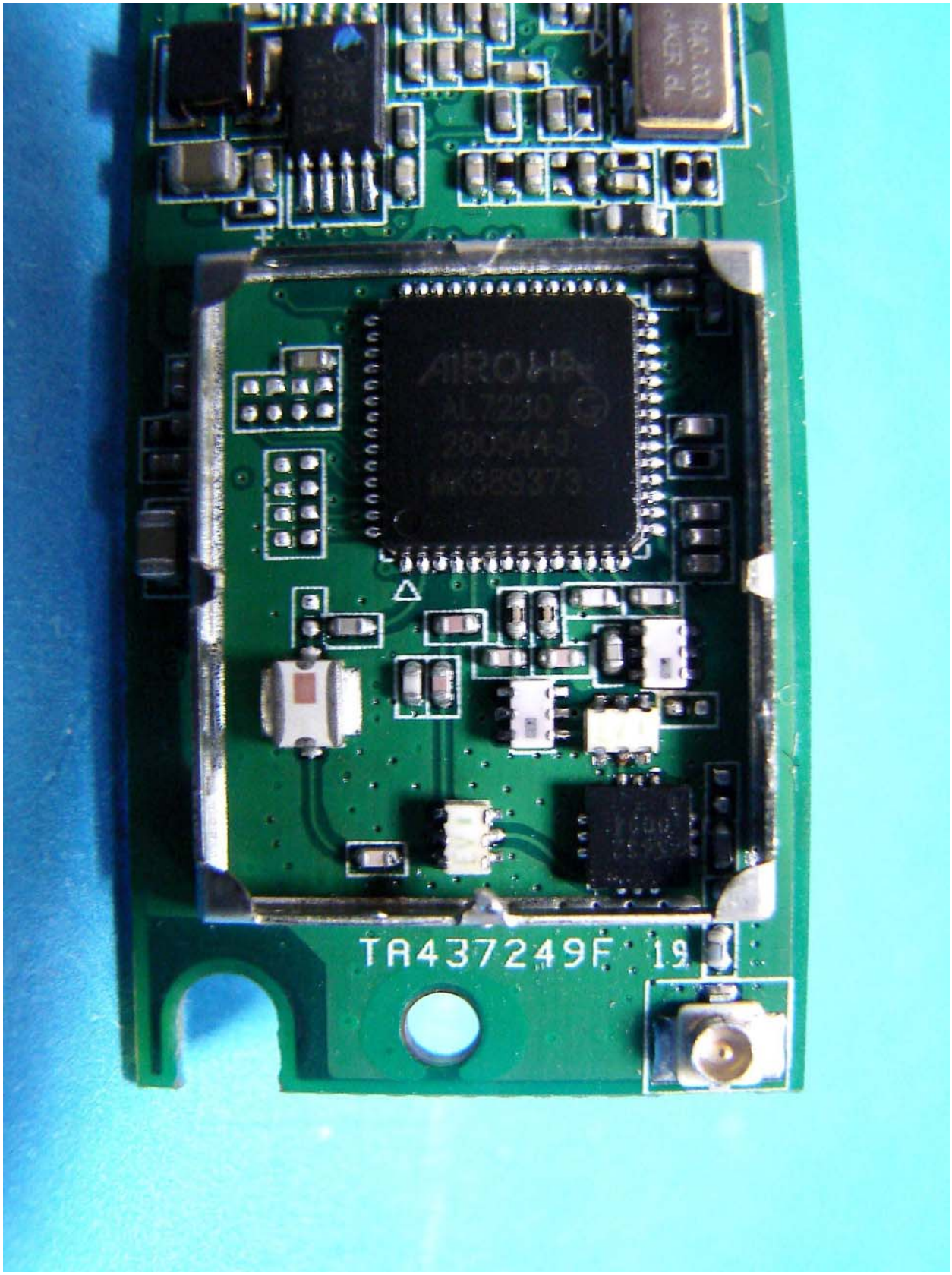
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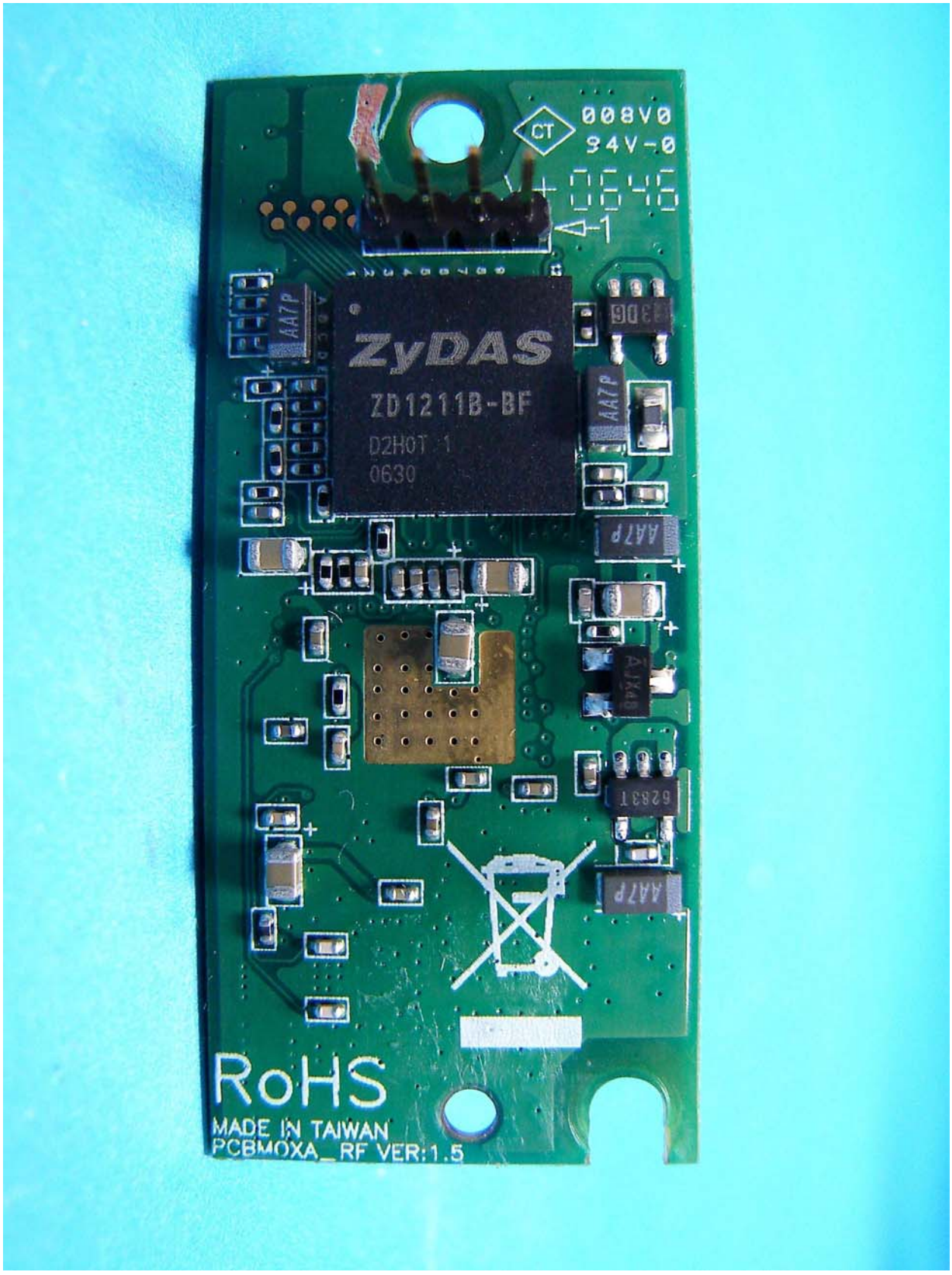
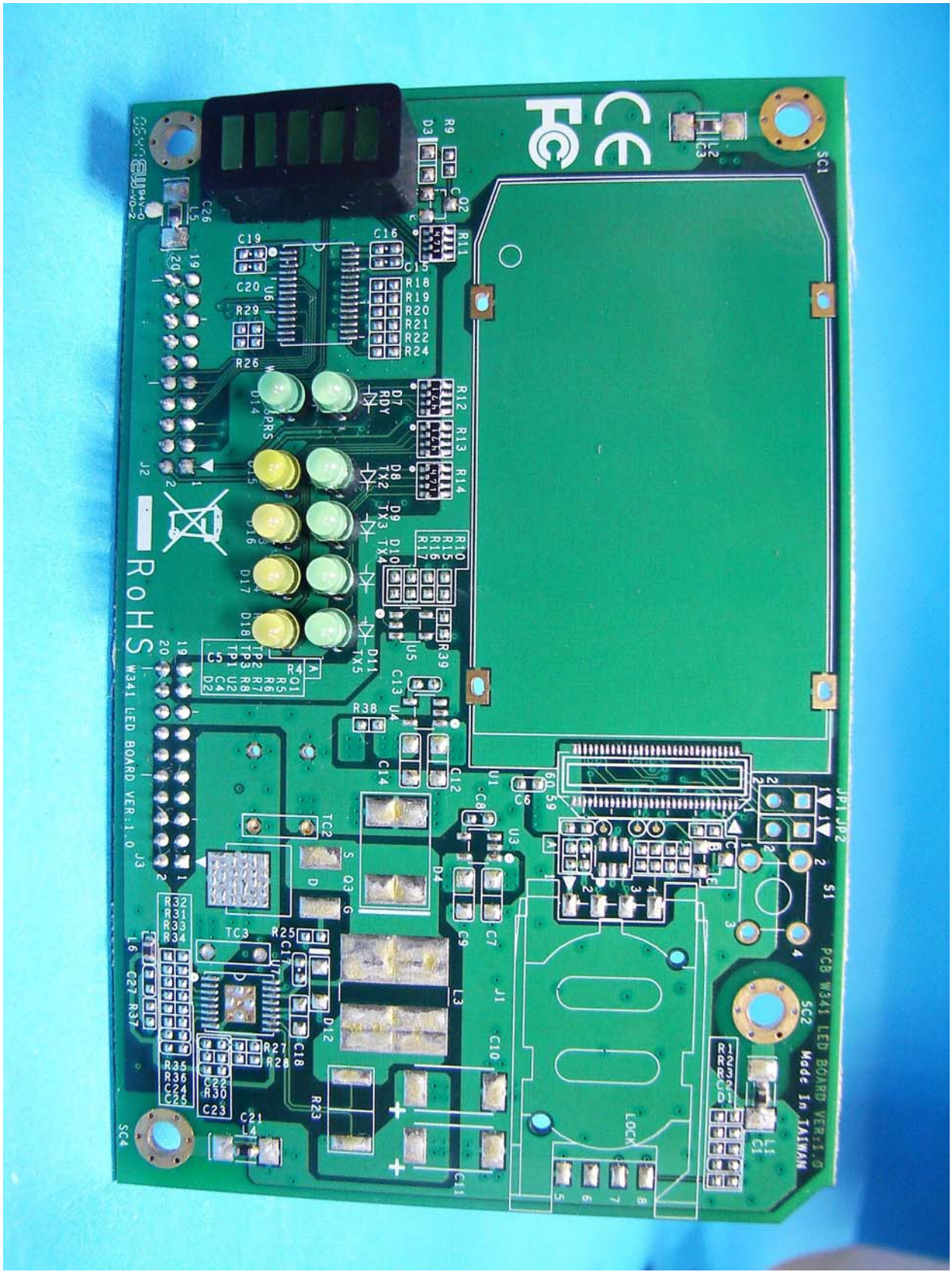
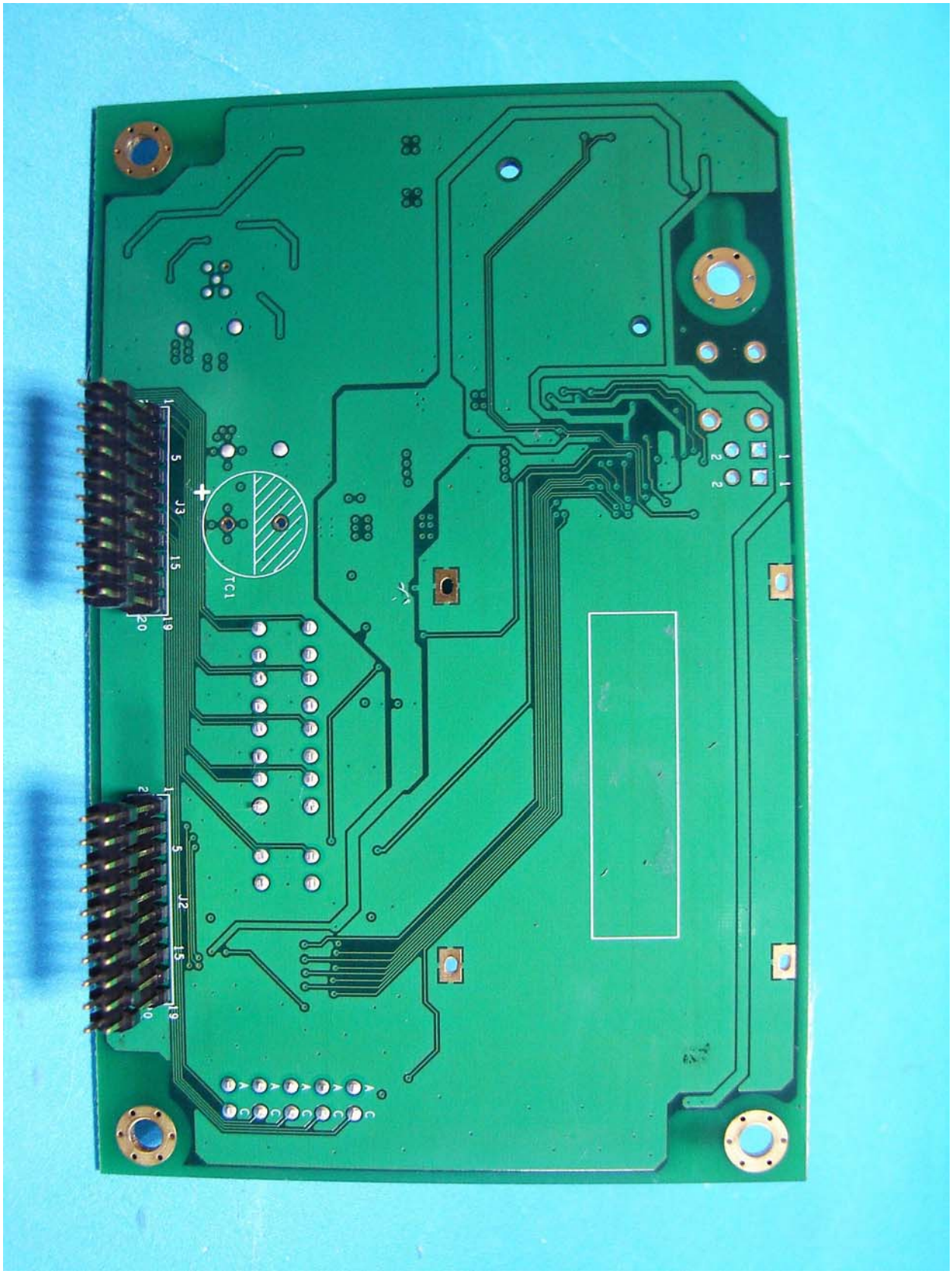

ZyDAS
ZD1211B-BF
D2H0T 1
0630
RoHS
MADE IN TAIWAN
PCBMOXA_RF VER:1.5


W341 LED BOARD VER:1.0
PCB W341 LED BOARD VER:1.0
Made In TAIWAN
RoHS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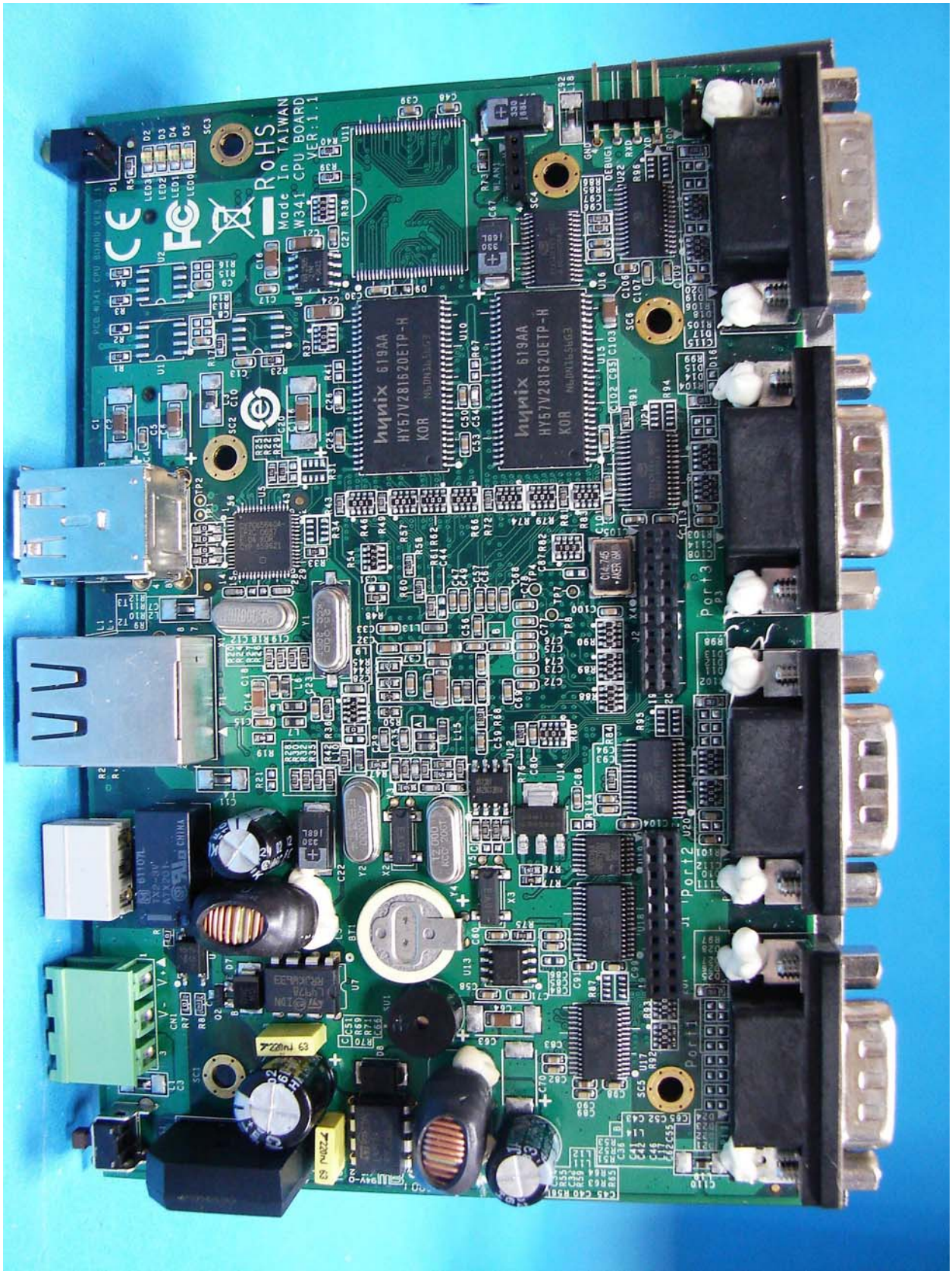
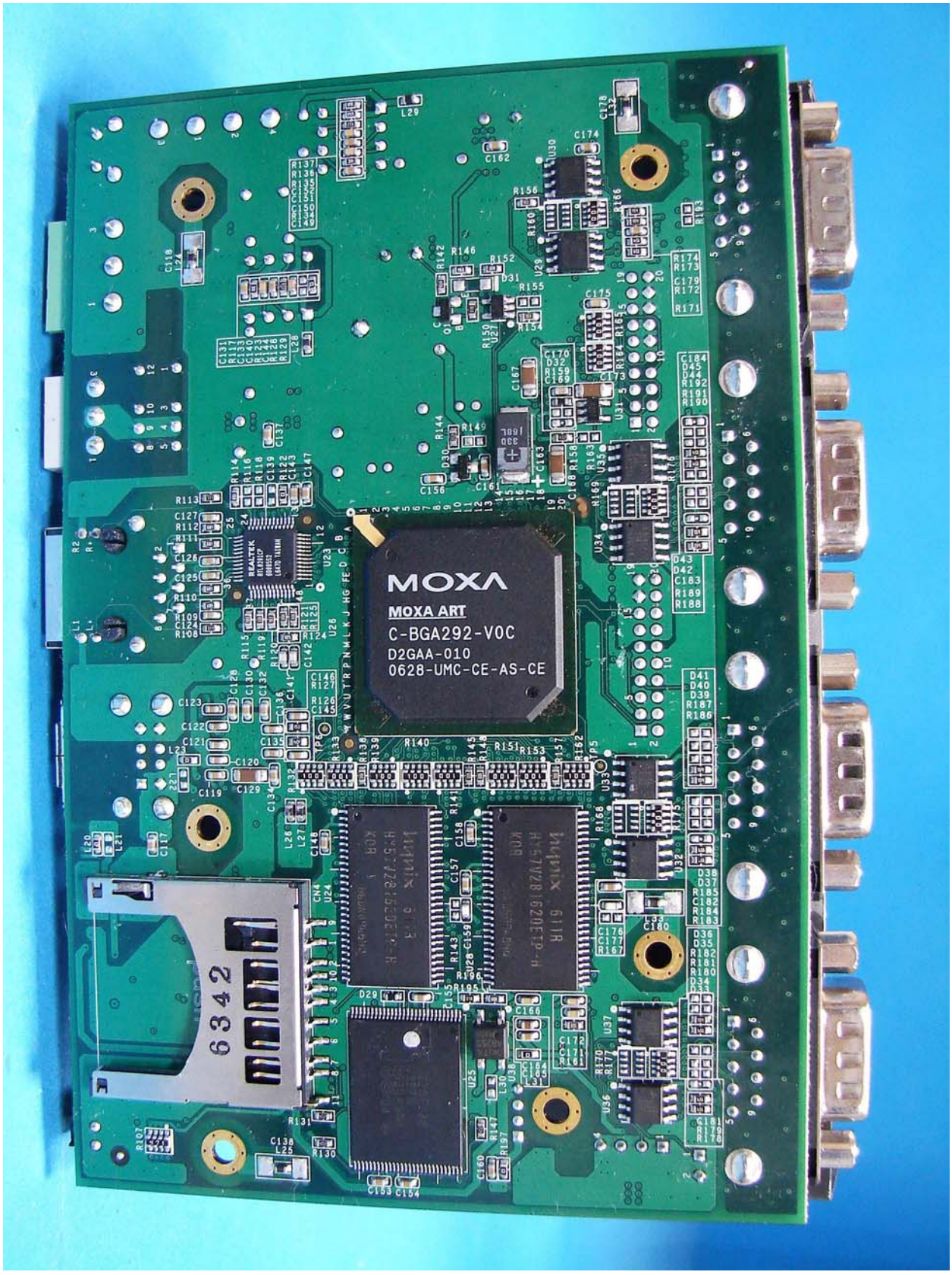
J2
TC1


RoHS
Made In TAIWAN
W341 CPU BOARD
VER:1.1
Hynix 619AA
HY57V281620ETP-H
KOR
Port3
Port2
Port1


MOXA
MOXA ART
C-BGA292-V0C
D2GAA-010
0628-UMC-CE-AS-CE
6342

Label Information

LABEL Format:

Trade Name CE Model Number The device complies with Part 15 of the FCC Rules. See instruction manual.

LABEL Size: 70 x 50 mm

LABEL Position:

Technical Description

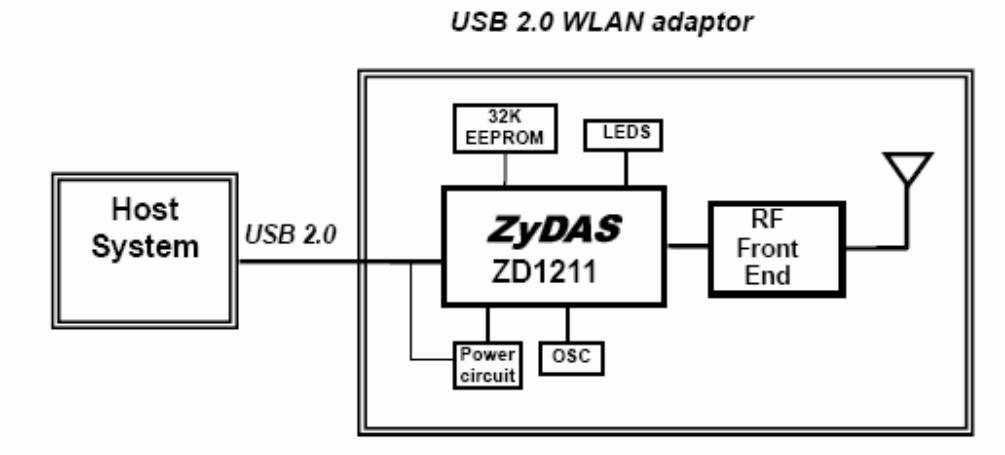
Operation Principles:

AL7230：

AL7230 is a highly integrated RF transceiver IC for 2.4 GHz and 5 GHz dual-band 802.11a/b/g applications, and combines all functions of the transceiver in a single chip. AL7230 also integrates on-chip PA and PLL with embedded loop filter to help you to minimize the use of external components to design an RF subsystem .The receive path includes two single-ended input Low Noise Amplifiers (LNA) and down-conversion mixers with DC-offset cancellation for both 2.4GHz and 5GHz band, and a variable gain amplifier with a baseband low-pass filter without the need of external SAW filters .The transmitter consists of a up-conversion quadrate modulator with a baseband low pass filter, a variable gain amplifier, and two power amplifiers with power detector and temperature sensor to complete the whole transmit path function for both 2.4GHz and 5GHz band. A power-on calibration procedure is established to correct the TX DC offset, filters mismatch and phase imbalance. These functions are housed in a 56-pin QFPN package.

ZD1211B：

ZD1211 is a compact, low power, high security and high performance solution for versatile WLAN applications.ZD1211 integrates WLAN MAC controller, base-band processor and USB 2.0 interface in single chip. The integrated USB 2.0 controller reduces the cost and design complexity. No extra memory device is needed. It can fit into small PCB form factor. There is Micro-Controller inside the chip. This allows the flexibility to software change the operation scenario to adapt in USB or WLAN compatibility issues. Integrated standard compliant hardware security engine to improve the performance in security mode. The hardware engine includes the WEP64, WEP128, WEP256, AES-CCM, TKIP that comply Wi-Fi and IEEE 802.11 defined standards. ZD1211 considers the power management issues in WLAN applications and USB certification. It provides the lower power consumption for WLAN in power saving mode and USB suspend mode. ZD1211 can operate in the mode of station and access point. It can fit to feature demand in different WLAN applications. Optional 16 bit host interface is provided. This interface can connect to the memory bus of host processor . It will be useful in embedded application.

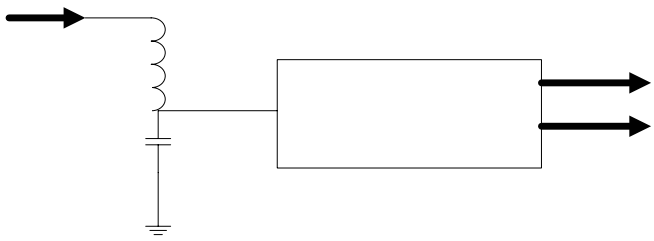


1. 802.11 supported speed and modulation

Standard	Modulation Type	Data Rate	Modulation First/Second	Encoding Rate	Note
IEEE802.11a	OFDM.BPSK (6 Mbps)	6 Mbps	BPSK/OFDM	1/2	
	OFDM.BPSK (9 Mbps)	9 Mbps	BPSK/OFDM	3/4	
	OFDM.QPSK (12 Mbps)	12 Mbps	QPSK/OFDM	1/2	
	OFDM.QPSK (18 Mbps)	18 Mbps	QPSK/OFDM	3/4	
	OFDM.16QAM (24 Mbps)	24 Mbps	16QAM/OFDM	1/2	
	OFDM.16QAM (36 Mbps)	36 Mbps	16QAM/OFDM	3/4	
	OFDM.64QAM (48 Mbps)	48 Mbps	64QAM/OFDM	2/3	
	OFDM.64QAM (54 Mbps)	54 Mbps	64QAM/OFDM	3/4	
	AUTO	Auto	Auto		
IEEE802.11b	DSSS.DBPSK (1 Mbps)	1 Mbps	DBPSK/DSSS		LongPLCP
	DSSS.DQPSK (2 Mbps)	2 Mbps	DQPSK/DSSS		LongPLCP or ShortPLCP
	CCK (5.5 Mbps)	5.5 Mbps	CCK		
	CCK (11 Mbps)	11 Mbps	CCK		
	PBCC.BPSK (5.5 Mbps)	5.5 Mbps	BPSK/PBCC		
	PBCC.QPSK (11 Mbps)	11 Mbps	QPSK/PBCC		
	AUTO	Auto	Auto		
IEEE802.11g	DSSS.DBPSK (1 Mbps)	1 Mbps	DBPSK/ERP_DSSS		LongPLCP
	DSSS.DQPSK (2 Mbps)	2 Mbps	DQPSK/ERP_DSSS		LongPLCP or ShortPLCP
	CCK (5.5 Mbps)	5.5 Mbps	CCK		
	CCK (11 Mbps)	11 Mbps	CCK		
	PBCC.BPSK (5.5 Mbps)	5.5 Mbps	BPSK/ERP_PBCC		
	PBCC.QPSK (11 Mbps)	11 Mbps	QPSK/ERP_PBCC		
	PBCC.8PSK (22 Mbps)	22 Mbps	8PSK/ER_PBCC		
	PBCC.8PSK (33 Mbps)	33 Mbps	8PSK/ER_PBCC		
	OFDM.BPSK (6 Mbps)	6 Mbps	BPSK/DSSS_OFDM	1/2	
	OFDM.BPSK (9 Mbps)	9 Mbps	BPSK/DSSS_OFDM	3/4	
	OFDM.QPSK (12 Mbps)	12 Mbps	BPSK/DSSS_OFDM	1/2	
	OFDM.QPSK (18 Mbps)	18 Mbps	BPSK/DSSS_OFDM	3/4	
	OFDM.16QAM (24 Mbps)	24 Mbps	16QAM/DSSS_OFDM	1/2	
	OFDM.16QAM (36 Mbps)	36 Mbps	16QAM/DSSS_OFDM	3/4	
	OFDM.64QAM (48 Mbps)	48 Mbps	64QAM/DSSS_OFDM	2/3	
	OFDM.64QAM (54 Mbps)	54 Mbps	64QAM/DSSS_OFDM	3/4	
	AUTO	Auto	Auto		

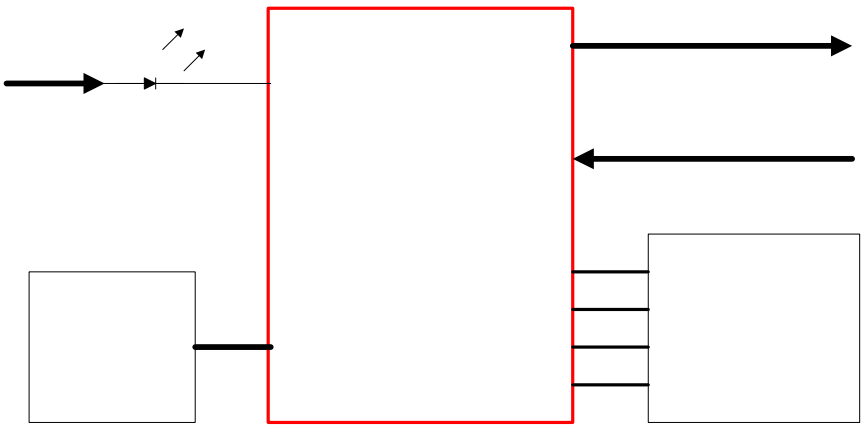
2. Clock system

That oscillator is support 40MHz clock to RF/PLL, Analog, and Digital circuit. Among DC noise must be isolated by LC circuit.



3. Baseband Chipset

ZD1211 integrates WLAN MAC controller, base-band processor and USB 2.0 interface in single chip. ZD1211 needs a 32K bit or 64K bit serial EEPROM to provide the card identification on booting stage and RF information on operation. The interface also provides software interface to read and write EEPROM. USB 2.0 interface is fully compatible to 480M USB high speed mode and 12M full speed mode. It integrates USB 2.0 physical layer transceiver and controller in chip. The embedded microcontroller and serial EEPROM provide flexibility for customization of card identification in USB enumeration. The behavior of LED may be programmable by software on host system.



4. Transceiver and Front-end

The AL7230 is a 2.4/5GHz dual-band transceiver for 802.11a/b/g applications. There are five main blocks – power amplifier, transmitter, receiver, synthesizer and three-wire interface. And external two baluns transfer 2.4/5GHz power to antenna. The receiver path includes two single-ended input Low Noise Amplifiers, down-conversion mixers with DC-offset cancellation for both 2.4GHz and 5GHz band, and a variable gain amplifier with a baseband low-pass filter without the external SAW filter.

User Manual

ThinkCore W311/321/341
Hardware User's Manual

First Edition, December 2006

www.moxa.com/product

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ThinkCore W311/321/341
Hardware User's Manual

The software described in this manual is furnished under a license agreement and may be used only in accordance with the terms of that agreement.

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1

Introduction

The ThinkCore W300 Series is a line of wireless RISC-based embedded computers that feature 802.11a/b/g WLAN, RS-232/422/485 serial ports, and an Ethernet port in a small, rugged chassis. In addition, the W321 and W341 models feature an SD slot, and the W341 features two USB 2.0 hosts and one relay output channel.

As part of the W300 Series, your embedded computer is ideal for diverse, machine-to-machine embedded applications. It enables wireless operation of traditionally wired network and serial devices and not only provides transparent data transfer, but also numeric computing, protocol conversion, data processing and even data encryption. You will find it easier to build embedded systems for distributed peer-to-peer communication, turn wired devices into wireless devices, and introduce higher mobility and more intelligence to your system. In this chapter, learn about the capabilities of the embedded computer.

This chapter covers the following topics:

- **Overview**
- **Package Checklist**
- **Product Features**
- **Product Hardware Specifications**
- **Hardware Block Diagram**
  - ThinkCore W311
  - ThinkCore W321
  - ThinkCore W341

Overview

The ThinkCore W300 Series wireless embedded computer is designed around the MOXA ART ARM9 32-bit RISC processor. Unlike the X86 CPU, which uses a CISC design, the MOXA ART ARM9 uses RISC architecture and modern semiconductor technology to provide a powerful computing engine without generating significant heat. The processor also integrates UART and LAN functions to provide exceptional communication performance, but without the bus bandwidth limitations associated with general ARM-based communication products.

On-board NOR Flash ROM and SDRAM provides ample storage capacity, and for select models, the SD slot gives applications extra room to expand. The built-in WLAN function supports the 802.11a/b/g standard, providing transmission security with WEP, WPA and WPA2. The backup LAN port not only provides an alternative solution for networking but also supports Ethernet clients, allowing any network device to plug in and connect to the WLAN. The built-in RS-232/422/485 serial ports support a wide range of serial devices, making this platform suitable for data acquisition and protocol conversion applications.

The Linux-based operating system comes pre-installed and ready to run, providing an open platform for software development. Software written for desktop PCs can easily be ported to W300 Series embedded computers by using a common complier, so little time is spent modifying existing software code. In addition, the operating system, device drivers, and user-developed software can all be stored in the built-in flash memory.

Package Checklist

The ThinkCore W300 Series includes the following models:

ThinkCore W311-LX
A small, RISC-based, ready-to-run, wireless embedded computer with WLAN, one serial ports, Ethernet, and μClinux OS

ThinkCore W321-LX
A small, RISC-based, ready-to-run, wireless embedded computer with WLAN, two serial ports, Ethernet, SD slot, and μClinux OS

ThinkCore W341-LX
A RISC-based, ready-to-run, wireless embedded computer with WLAN, four serial ports, Ethernet, SD slot, USB port, relay output, and Linux OS

Each model is shipped with the following items:

- ThinkCore W300 Series wireless embedded computer
- Quick Installation Guide
- Documentation & Software CD
- 100 cm RJ45-to-RJ45 Ethernet cross-over cable
- 100 cm console port cable (CBL-4PINDB9F-100)
- Universal Power Adaptor
- Product Warranty Statement

Optional Accessories

- 35 mm DIN-rail mounting kit (DK-35A)

NOTE*: Notify your sales representative if any of the above items are missing or damaged.*

Product Features

ThinkCore W300 Series computers have the following features:

- MOXAART 32-bit ARM9 industrial communication processor
- 16 MB on-board RAM (64 MB for W341)
- 8 MB built-in flash memory (16 MB for W341)
- 802.11a/b/g Wireless LAN
- WEP, WPA and WPA2 encryption
- Infrastructure mode and Ad-Hoc mode
- RS-232/422/485 serial ports with software selectable interface
- Baudrates between 50 and 921.6 Kbps, including all nonstandard baudrates
- 10/100M Ethernet for backup networking
- SD card slot for storage expansion (W321 and W341 only)
- Withstands 5G continuous vibration and 50G shock
- LED indicators for status, serial transmission, and wireless signal strength
- Ready-to-run Linux platform
- Installation on DIN-rail or wall
- Fanless design for increased ruggedness

Product Hardware Specifications

System

CPU	MOXA ART ARM9 32-bit RISC CPU, 192 MHz		
DRAM	W311: 16 MB	W321: 16 MB	W341: 64 MB
Flash	W311: 8 MB	W321: 16 MB	W341: 64 MB
Storage Expansion	W311: None	W321: SD slot × 1	W341: SD slot × 1
USB	W341: USB 2.0 host × 2		
Relay Output	Form C, SPDT × 1 Normal switching capacity: Switching power: Switching voltage: Switch current: Operation time: Initial contact resistance:	 2 A @30 VDC 60 W max. 220 VDC max. 2 A max. 4 ms @20°C 100 Mohm max.	
Console port	RS-232 × 1 (TxD, RxD, GND), 4-pin header output, "115200, n, 8, 1"		
Button	Reset button × 1, supports "Reset to Factory Default"		
Others	RTC, buzzer, Watchdog Timer		
OS	W311: μClinux, based on Linux Kernel 2.6 W321: μClinux, based on Linux Kernel 2.6 W341: Built-in Embedded Linux with MMU support		

WLAN Communication

Standard Compliance	802.11a/b/g
Radio Frequency Type	DSSS, CCK, OFDM
Radio Frequency Band	802.11a: 5.15 to 5.25 GHz (Indoor used only) 802.11b/g: U.S., Europe and Japan product covering 2.4 to 2.484 GHz
Media Access Protocol	Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)
Modulation	802.11a/g: OFDM (64-QAM, 16-QAM, QPSK, BPSK) 802.11b: DSSS (DBPSK, DQPSK, CCK)
Transmission Power (Typical)	5.15 to 5.25 GHz: 15 dBm @6 Mbps; 12 dBm @54 Mbps 2.412 to 2.462 GHz (IEEE802.11g): 17 dBm @6 Mbps; 15 dBm @54Mbps 2.412 to 2.462 GHz (IEEE802.11b): 18 dBm@ 1 to 11 Mbps
Receiver Sensitivity (Typical)	5.15 to 5.25 GHz: 6 Mbps @ -90 dBm; 54 Mbps @ -72 dBm 2.412 to 2.462 G (IEEE802.11g): 6 Mbps @ -90 dBm; 54 Mbps @ -73 dBm 2.412 to 2.462 G (IEEE802.11b): 11 Mbps @ -87 dBm; 1 Mbps @ -94 dBm
Transmission Rate	54 Mbps with auto fallback (54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, 1 Mbps) 802.11b supported rates: 1, 2, 5.5, 11 Mbps 802.11a/g supported rates: 6, 9, 12, 18, 24, 36, 48, 54 Mbps
Transmission distance	100 meters at 11 Mbps (with no obstructions)
Security	WEP 64-bit/128-bit, WPA, WPA2 data encryption
Antenna Connector	Reverse SMA
Antenna	External 2 dBi dipole antenna
WLAN Mode	Infrastructure, Ad-Hoc

Network Communication

LAN	10/100 Mbps RJ45 × 1, auto-sensing
Protection	1.5 KV built-in magnetic isolation protection

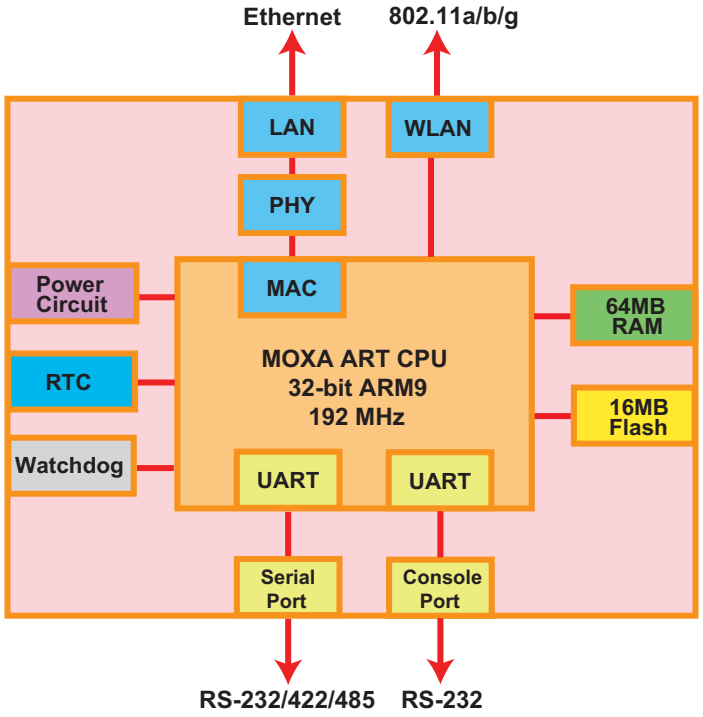
Serial Communication

Serial Port	W311: RS-232/422/485 DB9 male × 1 W321: RS-232/422/485 DB9 male × 2 W341: RS-232/422/485 DB9 male × 4
Protection	15 KV built-in ESD protection for all signals
Data bits	5, 6, 7, 8
Stop bits	1, 1.5, 2
Parity	None, Even, Odd, Space, Mark
Flow Control	RTS/CTS, XON/XOFF, RS-485 ADDC™
Speed	50 bps to 921.6 Kbps, including all nonstandard baudrates

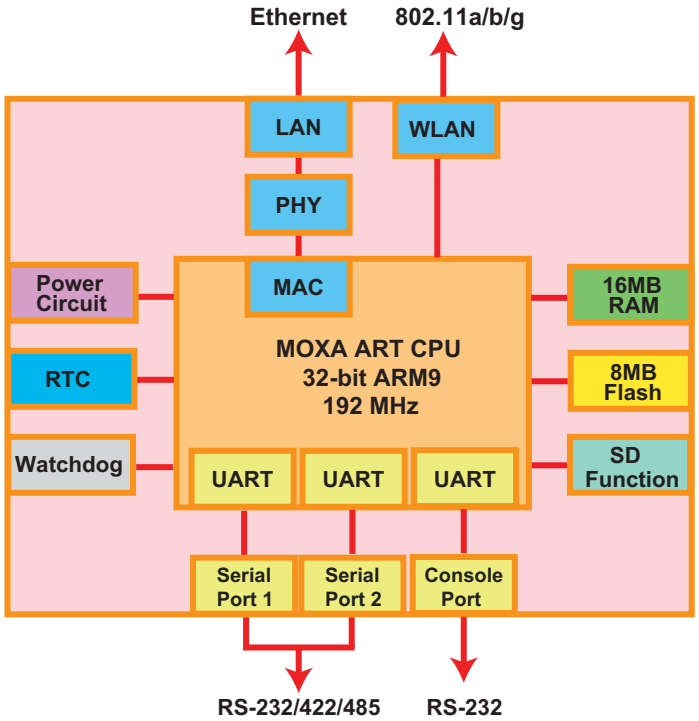
LEDs	
System	Ready, SD activity (for W321 and W341 only)
WLAN	Enable, signal strength
LAN	10 M/Link, 100 M/Link
Serial	TxD, RxD
Power Requirements	
Power Input	12 to 48 V
Power Consumption	W311: 250 mA @12 VDC, 3 W W321: 300 mA @12 VDC, 3.6 W W341: 540 mA @12 VDC, 6.5 W
Mechanical	
Dimension (W × D × H)	(without wall mount ear or antenna) W311: 67 × 100.4 × 22 mm W321: 77 × 111 × 26 mm W341: 150 × 100 × 38 mm
Antenna	110 mm
Construction Material	W311: aluminum, 1 mm W321: aluminum, 1 mm W341: aluminum, 1 mm / SECC, 1 mm for rear panel
Mounting	DIN-rail, wall
Environmental	
Operating Temperature	-10 to 60°C (14 to 140°F), 5 to 95% RH
Storage Temperature	-20 to 80°C (-4 to 176°F), 5 to 95% RH
Regulatory Approvals	
EMC	FCC, CE
Safety	TÜV, UL, cUL
Others	RoHS, CRoHS, WEEE
Warranty	5 years

Hardware Block Diagram

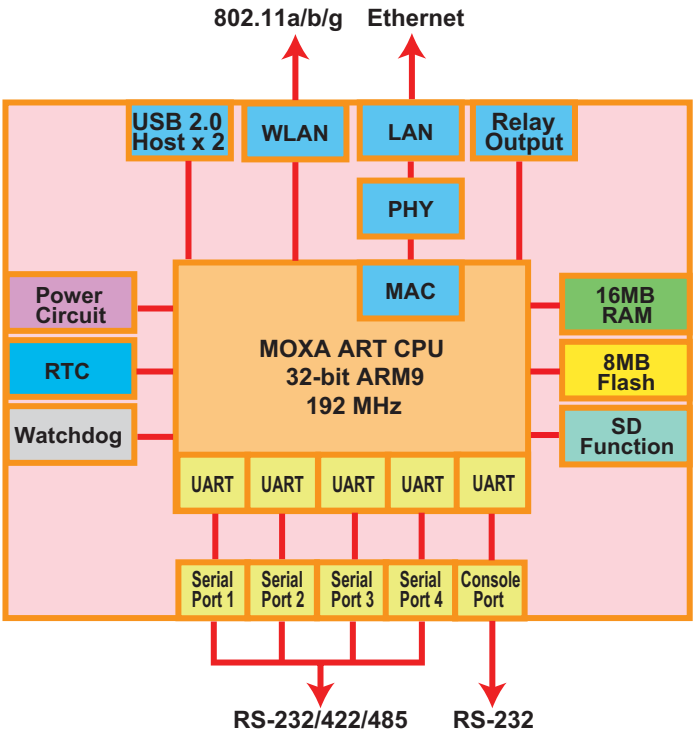
ThinkCore W311



ThinkCore W321



ThinkCore W341



2

Hardware Introduction

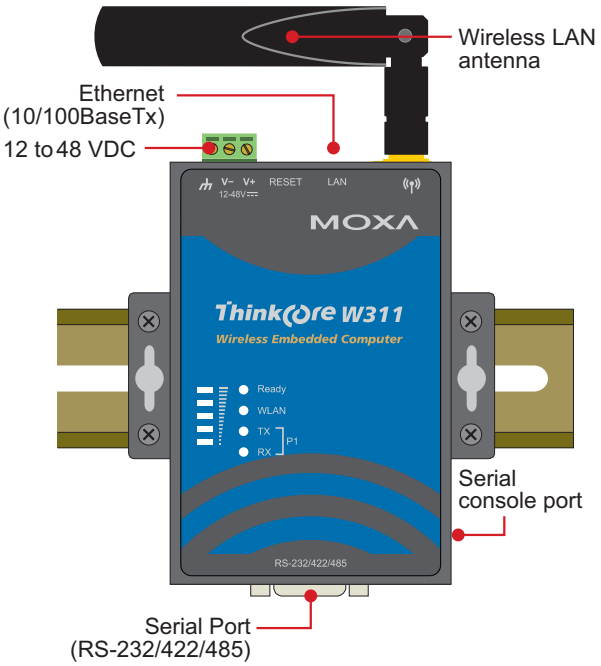
ThinkCore W300 Series hardware is compact, well-designed, and built rugged for industrial applications. LED indicators help you monitor the performance and identify trouble spots. Multiple ports allow the connection of different devices for wireless operation. With the reliable and stable hardware platform that is provided, you may devote your attention to the development of your application. In this chapter, learn the basics about the embedded computer hardware and its different parts.

This chapter covers the following topics:

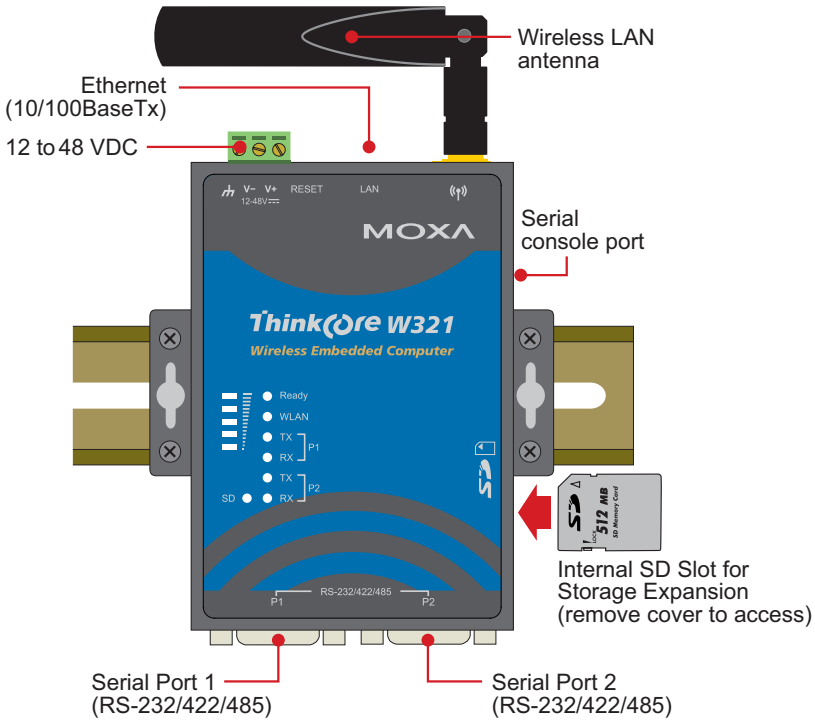
- **Appearance**
  - ThinkCore W311
  - ThinkCore W321
  - ThinkCore W341
- **Dimensions**
  - ThinkCore W311
  - ThinkCore W321
  - ThinkCore W341
- **LED Indicators**
- **Reset Button**
- **Real Time Clock**

Appearance

ThinkCore W311

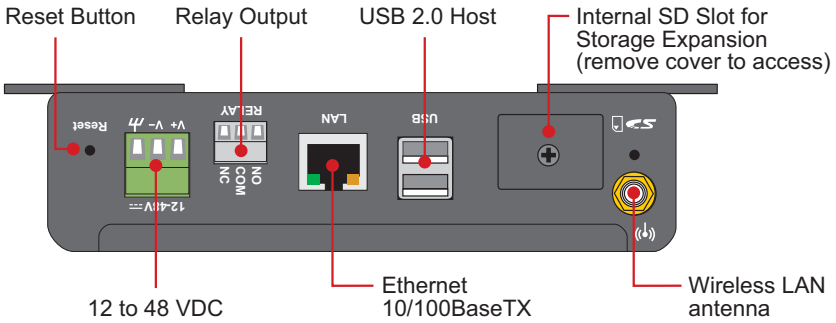


ThinkCore W321

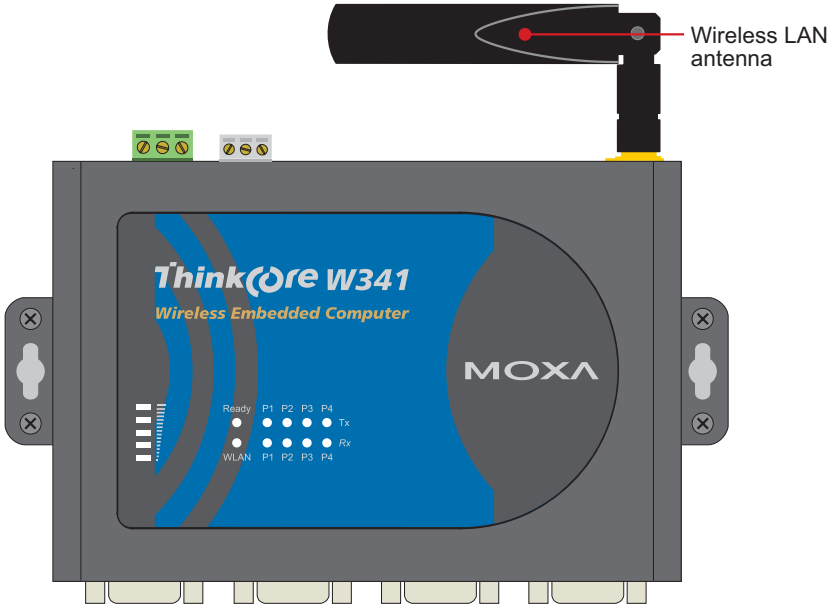


ThinkCore W341

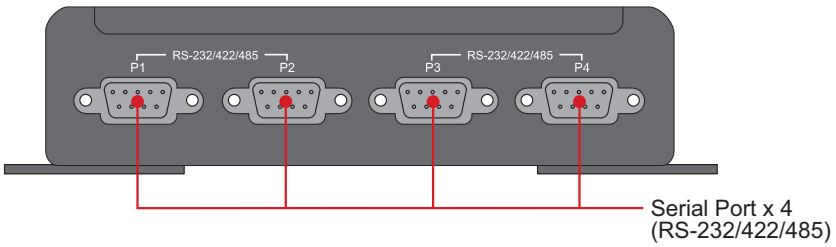
Top View



Front View

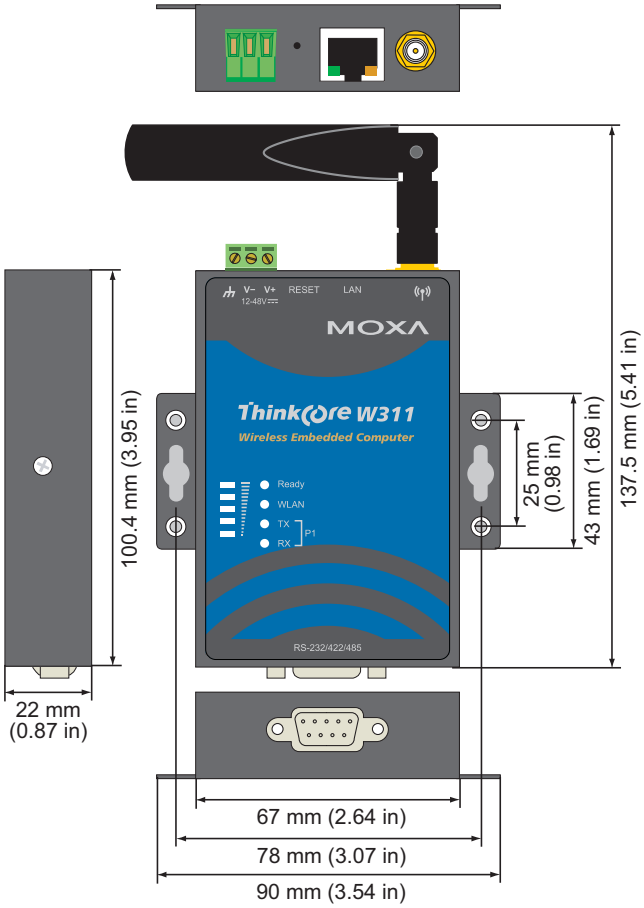


Bottom View

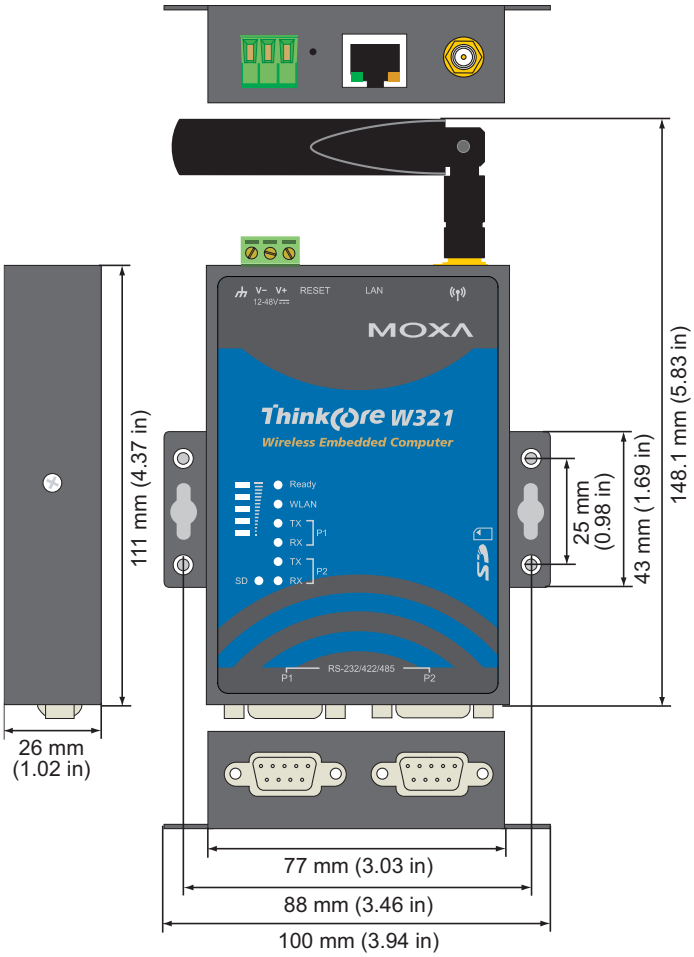


Dimensions

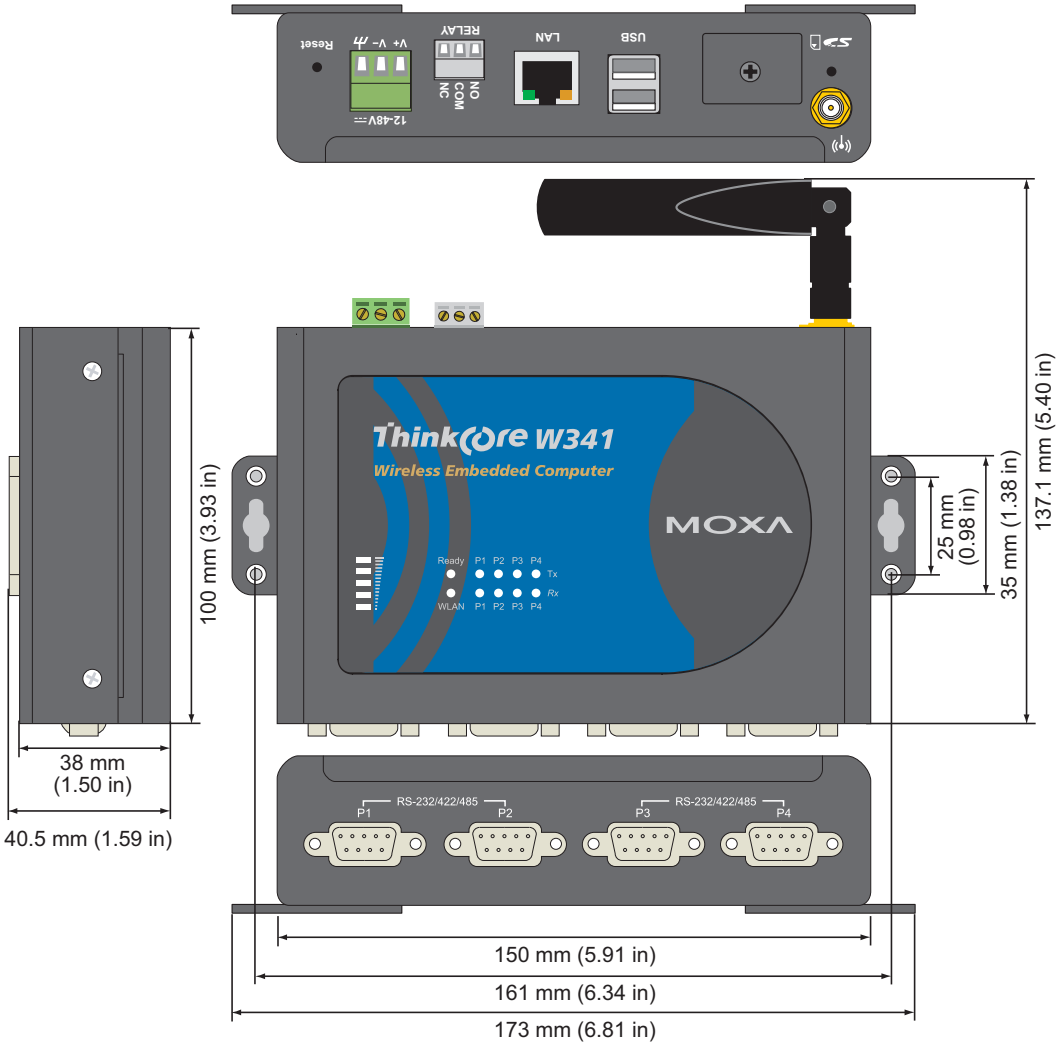
ThinkCore W311



ThinkCore W321



ThinkCore W341



LED Indicators

Please note that the W311 does not include an SD slot, so it will not have an SD LED.

LED Name	LED Color	LED Function
Ready	Green	Power is on and functioning normally
	Off	Power is off or there is another power error
SD	Green	SD card is detected
	Off	No SD card is detected
WLAN	Green	ON: WLAN is ready
		Blinking: Conflict with WLAN IP or no response from DHCP server
	Off	WLAN is not ready or function error
Signal Strength	Green	Number of glowing LEDs indicates signal strength 5: Excellent 4: Very good 3: Good 2: Fair 1: Bad
	Off	No signal or WLAN connection failed
LAN	Orange	10 Mbps Ethernet link
	Green	100 Mbps Ethernet link
	Off	Disconnected or short circuit
TxD P1-P4	Green	Serial ports P1-P4 transmitting data
	Off	Serial ports P1-P4 not transmitting data
RxD P1-P4	Yellow	Serial ports P1-P4 receiving data
	Off	Serial ports P1-P4 not receiving data

Reset Button

Hold the reset button down for 5 seconds to load the factory default configuration. After loading the factory defaults, the system will reboot automatically. We recommend that you use this function only if the software is not working properly. To reset the Linux system software, always use the software reboot command ("reboot") to protect the integrity of data.

The reset button is NOT designed as a hard reboot for the embedded computer.

ATTENTION

Restoring default settings preserves your data

Resetting the embedded computer to factory defaults will NOT format the user directory and will NOT erase the user's data. The reset button only loads a configuration file. All files in the **/etc** directory will revert to their factory defaults, but all other user data will remain intact in the Flash ROM.

Please note that if there is a problem with the **/etc** directory, the embedded computer may be unable to restore the factory default settings.

Real Time Clock

The embedded computer's real-time clock is powered by a lithium battery. We strongly recommend that you NOT replace the lithium battery on your own. If the battery needs to be changed, please contact the MOXA RMA service team.

ATTENTION

There is a risk of explosion if the wrong type of battery is used. To avoid this potential danger, always be sure to use the correct type of battery. Contact the MOXA RMA service team for battery replacement.

3

Hardware Connection Description

ThinkCore W300 Series wireless embedded computers are equipped for multiple types of connections. WLAN, Ethernet, and multiple serial interfaces are built into every model, including a serial console port for monitoring of bootup messages. Select models also include an SD slot for storage expansion, USB ports for additional device and storage options, and relay output connections. With the open-source Linux kernel, you are free to develop custom applications for remote, wireless operation of your device. In this chapter, learn how to connect the embedded computer to the network and to various devices.

This chapter covers the following topics:

- **Wiring Requirements**
  - Connecting the Power
  - Grounding the Unit
- **Connecting Data Transmission Cables**
  - Connecting to the Network
  - Connecting to the WLAN
  - Connecting to a Serial Device
  - Serial Console Port
- **SD Slot (W321 and W341 only)**
- **USB (W341 only)**
- **Relay Output (W341 only)**

Wiring Requirements

This section describes how to connect serial devices to the embedded computer.

You should heed the following common safety precautions before proceeding with the installation of any electronic device:

- Use separate paths to route wiring for power and devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point.

  NOTE: Do not run signal or communication wiring and power wiring in the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.

- Use the type of signal transmitted through a wire to determine which wires should be kept separate. The rule of thumb is that wiring that shares similar electrical characteristics can be bundled together.
- Keep input wiring and output wiring separate.
- It is advisable to label the wiring to all devices in the system.

ATTENTION

Safety First!

Be sure to disconnect the power cord before installation and/or wiring.

Watch Electrical Current!

Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size.

If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

Watch Temperature!

Be careful when handling the unit. When the unit is plugged in, the internal components generate heat, and consequently the outer casing may feel hot to the touch.

Connecting the Power

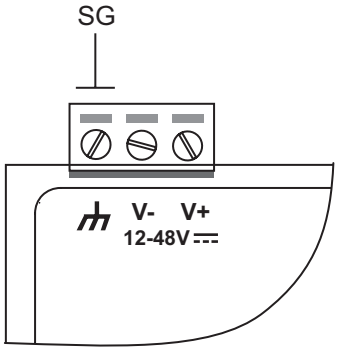
Connect the "live-wire" end of the 12-48 VDC power adapter to the embedded computer's terminal block. When power is properly supplied, the "Ready" LED will glow a solid green after a 25 to 30 second delay.

Grounding the Unit

Grounding and wire routing help limit the effects of noise due to electromagnetic interference (EMI). Before connecting any devices, run a ground wire from the ground screw to the grounding surface.

ATTENTION

This product should be mounted to a well-grounded mounting surface such as a metal panel.



SG: The ***Shielded Ground*** (sometimes called Protected Ground) contact is the left most contact of the 3-pin power terminal block connector, as viewed from the angle shown here. Connect the SG wire to an appropriate grounded metal surface.

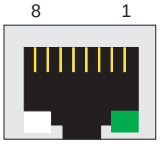
Connecting Data Transmission Cables

This section describes how to connect cables for the network, serial devices, and serial COM terminal.

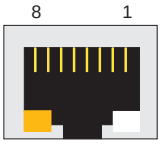
Connecting to the Network

Plug your network cable into the embedded computer's Ethernet port. The other end of the cable should be plugged into your Ethernet network. When the cable is properly connected, the LEDs on the embedded computer's Ethernet port will glow to indicate a valid connection.

The 10/100 Mbps Ethernet LAN port uses 8-pin RJ45 connectors. The following diagram shows the pinouts for these ports.



The LED indicator in the lower right corner glows a solid green color when the cable is properly connected to a 100 Mbps Ethernet network. The LED will flash on and off when Ethernet packets are being transmitted or received.



The LED indicator in the lower left corner glows a solid orange color when the cable is properly connected to a 10 Mbps Ethernet network. The LED will flash on and off when Ethernet packets are being transmitted or received.

Pin	Signal
1	ETx+
2	ETx-
3	ERx+
4	---
5	---
6	ERx-
7	---
8	---

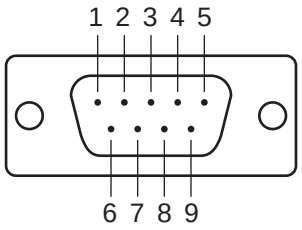
Connecting to the WLAN

The wireless embedded computer is WLAN ready and includes an 802.11 a/b/g WLAN module. It supports WEP, WPA and WPA2 data encryption. To verify WLAN operation, first configure your WLAN settings on the embedded computer using the serial console or a wired network connection. Please refer to the operating system user's manual for further detail.

Connecting to a Serial Device

Your serial device can plug into the embedded computer's serial port using a serial cable. Serial ports P1 to P4 have male DB9 connectors and can be configured for RS-232, RS-422, or RS-485 communication through software. The pin assignments are shown in the following table:

DB9 Male Port



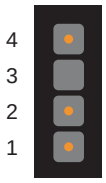
RS-232/422/485 Pinouts

Pin	RS-232	RS-422	RS-485 (4-wire)	RS-485 (2-wire)
1	DCD	TxDA(-)	TxDA(-)	---
2	RxD	TxDB(+)	TxDB(+)	---
3	TxD	RxDB(+)	RxDB(+)	DataB(+)
4	DTR	RxDA(-)	RxDA(-)	DataA(-)
5	GND	GND	GND	GND
6	DSR	---	---	---
7	RTS	---	---	---
8	CTS	---	---	---

Serial Console Port

The serial console port is a 4-pin pin-header RS-232 port. It is designed for serial console terminals, which are useful for viewing boot-up messages.

Serial Console Port & Pinouts



Pin	Signal
1	TxD
2	RxD
3	NC
4	GND

Serial Console Cable

SD Slot (W321 and W341 only)

Both the ThinkCore W321 and W341 include an SD slot for storage expansion. The SD slot allows users to add up to 1 GB of additional memory by inserting a Secure Digital (SD) memory card compliant with the SD 1.0 standard.

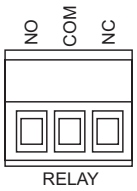
To install an SD card, remove the cover in order to access the slot. Insert the SD card into the slot and push it in until it clicks. To remove the card, push the card in until it clicks to release, then pull the card out.

USB (W341 only)

The ThinkCore W341 includes two USB 2.0 hosts. These hosts can be used for an external flash disk or hard drive in order to store large amounts of data.

Relay Output (W341 only)

The ThinkCore W341 includes a relay output channel. There is a 3-pin terminal block for the relay output connection, with pinouts as shown in the figure.



A

FCC Warning Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CAUTION:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Prohibition of co-location

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

Safety Information

To maintain compliance with FCC's RF exposure guidelines, when installing and/or operating this equipment, you should maintain a minimum distance of 20 cm between the transmitter and your body. Use only the supplied antenna. Unauthorized antennae, modifications, or attachments could damage the transmitter and may violate FCC regulations.

B

Service Information

This appendix shows you how to contact MOXA for information about this and other products, and how to report problems.

The following topics are covered in this appendix:

- **MOXA Internet Services**
- **Problem Report Form**
- **Product Return Procedure**

MOXA Internet Services

Customer satisfaction is our number one concern, and to ensure that customers receive the full benefit of our products, MOXA Internet Services has been set up to provide technical support, driver updates, product information, and user's manual updates.

The following services are provided

E-mail for technical support.....support@moxa.com

World Wide Web (WWW) Site for product information:

.....http://www.moxa.com

Problem Report Form

MOXA ThinkCore W311/321/341 Series

Customer name:	
Company:	
Tel:	**Fax:**
Email:	**Date:**

1. **MOXA Product:** ☐ ThinkCore W311 ☐ ThinkCore W321 ☐ ThinkCore W341
2. **Serial Number:** _____

Problem Description: Please describe the problem clearly. Include as many details as you can. This will help us reproduce the problem, and expedite the repair of your product.

Product Return Procedure

For product repair, exchange, or refund, the customer must:

- Provide evidence of original purchase.
- Obtain a Product Return Agreement (PRA) from the sales representative or dealer.
- Fill out the Problem Report Form (PRF). Include as much detail as possible for a shorter product repair time.
- Carefully pack the product in an anti-static package, and send it, pre-paid, to the dealer. The PRA should be visible on the outside of the package, and include a description of the problem, along with the return address and telephone number of a technical contact.

R&TTE Standards List

R&TTE List of Standard

With referring to the article of the directive of **R&TTE 1999/5/EC**, the following equipment:

Product Description / Supplementary Info	RISC-based Ready-to-Run Wireless Embedded Computer
Manufacturer	Moxa Technologies Co., Ltd.
Brand	Moxa
Type	ThinkCore W341-LX

has been tested to and conforms with the following ***List of R&TTE Harmonized standards:***

Standard	**Issue date**
ETSI EN 300 328 ETSI RF specification	V1.6.1 Nov. 2004 *Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2,4GHz ISM band and using spread spectrum modulation techniques;* *Harmonized EN covering essential requirements under article 3.2 of the* R&TTE Directive. Meets R&TTE directive art. 3.2.a on effective use of radio frequency spectrum so as to avoid harmful interference.
ETSI EN 301 893 ETSI RF specification	V1.3.1 Aug. 2005 *Broadband Radio Access Networks (BRAN); 5GHz high performance RLAN;* *Harmonized EN covering essential requirements of article 3.2 of the* R&TTE Directive. Meets R&TTE directive art. 3.2.a on effective use of radio frequency spectrum so as to avoid harmful interference.
ETSI EN 301 489-1 ETSI EN 301 489-17 ETSI EMC Specification	V1.5.1 Nov. 2004 V1.2.1 Apr. 2002 *Electromagnetic compatibility and Radio spectrum Matters(ERM);* *Electro Magnetic Compatibility (EMC) standard for radio equipment and services;* *Part 1 : Common Technical requirements* *Part 17 : Specific conditions for Wideband data and HIPERLAN equipment.* Meets R&TTE directive art. 3.1.b of essential requirements on protection with respect to Electro Magnetic Compatibility.

CE !

Draw up in	Taiwan
Date	2007/05/24
	Moxa Technologies Co., Ltd. Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C.
Signature & company stamp	Jackie Shi / Manager

R&TTE List of Standard

With referring to the article of the directive of **R&TTE 1999/5/EC**, the following equipment:

Product Description / Supplementary Info	RISC-based Ready-to-Run Wireless Embedded Computer
Manufacturer	Moxa Technologies Co., Ltd.
Brand	Moxa
Type	ThinkCore W341-LX

As such standards referred to tin Article 5 of the directive have not been applied or do not exist, the following ***Adopted solutions with descriptions and explanations*** as listed below, have been applied in full or in part, to meet the essential requirements of the directive:

Standard	**Issue date**
EN 50392 Health specification	2004 *Generic standard to demonstrate the compliance of electronic and electrical apparatus with the basic restrictions related to human exposure to electromagnetic fields (0 Hz-300 GHz)*

As such standards referred to tin Article 5 of the directive have not been applied or do not exist, the following ***Adopted solutions with descriptions and explanations*** as listed below, have been applied in full or in part, to meet the essential requirements of the directive:

Standard	**Issue date**
EN 60950-1 LVD specification	2001+A11:2004 *Safety of information technology equipment, including electrical business equipment.* Meets R&TTE directive art. 3.1.a of essential requirements on protection of the health and safety of the user.

CE !

Draw up in	Taiwan
Date	2007/05/24
	Moxa Technologies Co., Ltd. Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C.
Signature & company stamp	Jackie Shi / Manager

RF-EMC-LVD-MPE Test Reports and Corresponding Annexes

Report No.	M47ET060805
Specifications	ETSI EN 300 328 V.1.6.1 (2004-11)
Applicant	Moxa Technologies Co., Ltd.
Applicant address	Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C.
Items tested Model No. EUT Condition	RISC-based Ready-to-Run Wireless Embedded Computer ThinkCore W341-LX ☒Engineering sample; ☐Pre-production; ☐Final production (Sample # M470805)
Results	**Compliance** (As detailed within this report)
Date	11/29/2006 (month / day / year) (Sample received) 03/29/2007 ~ 05/04/2007 (Test)
Prepared by	Project Engineer (Jack Tsai)
Authorized by	General Manager (Frank Tsai)
Issue date	*May 09, 2007* (month / day / year)
Modifications	**None**
Tested by	Training Research Co., Ltd.
Office at	No. 255, Nan Yang Street, Shijr City, Taipei Hsien 221, Taiwan
Laboratory at	1F, No. 255, Nan Yang Street, Shijr City, Taipei Hsien 221, Taiwan
Open site at	No. 15, Lane 530, Balian Rd., Sec. 1, Shijr City, Taipei Hsien 221, Taiwan

Conditions of issue:

This test report shall not be reproduced except in full, without written approval of TRC. And the test result contained within this report only relate to the sample submitted for testing.

★ ***Aut. No. ELA 131***

We here by verify that:

The test data, data evaluation, test procedures and equipment configurations shown in this report were made mainly in accordance with the procedures given in ETSI EN 300 328 (V.1.6.1) as a reference. All test were conducted by ***Training Research Co., Ltd.***, 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. Also, we attest to the accuracy of each.

We further submit that the energy emitted by the sample EUT tested as described in the report is **in compliance with** the technical requirements set second edition in the European Telecommunication Standard ETSI EN 300 328 (V.1.6.1).

Reservation:

The test results herein refer only to the tested sample. Training Research Co., Ltd. is not responsible for any generalizations or conclusions draw from these test results and concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report.

Test by :

Training Research Co., Ltd.

TEL: 886-2-26935155 FAX: 886-2-26934440

No. 255, Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C.

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Appendix A: Antenna Specification 30

I. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of Applicant in support of a wireless LAN measurement in accordance with ETSI EN 300 328 V1.6.1 (November, 2004) of the European Telecommunication Standard.

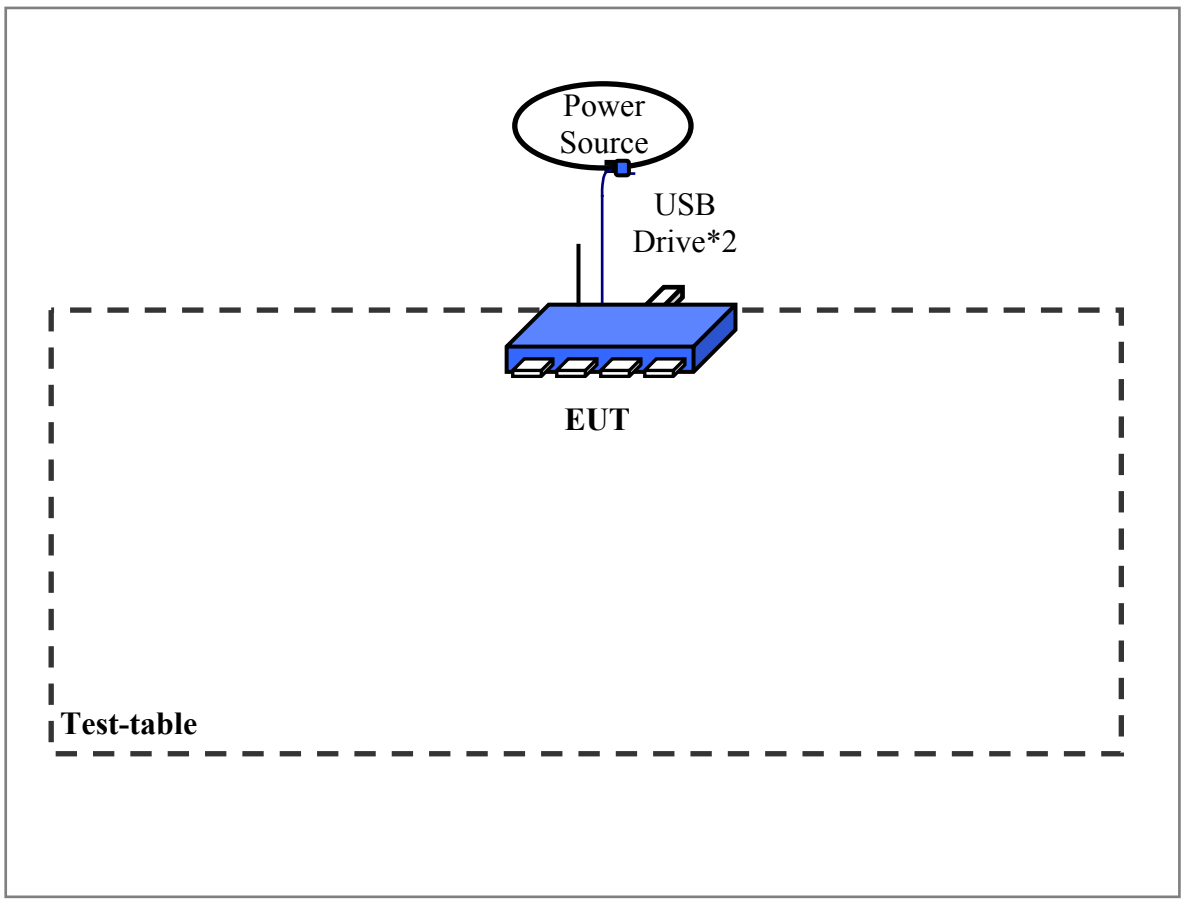
1.2 Description of EUT

Product Name	**:**	RISC-based Ready-to-Run Wireless Embedded Computer
Model No.	**:**	ThinkCore W341-LX
Frequency Range	**:**	2.400GHz ~ 2.4835GHz
Operating Frequency	**:**	2.412GHz ~ 2.472GHz
Support Channel	**:**	13 Channels
Channel Spacing	**:**	5MHz
Modulation Skill	**:**	DBPSK, DQPSK, CCK, OFDM
Power Type	**:**	Powered by the switching adapter, Manufacture: BALANCE ELECTRONICS CO., LTD. Model: GPSA-1200125 I/P: 100 ~ 240VAC ~ 50/60Hz 0.5A O/P: 12VDC 1.2A. Primary: 182cm length, non-shielded, without ferrite core Secondary: 186cm length, non-shielded, without ferrite core

1.3 Test Method

1. Using software provided by the manufacturer to control the EUT. The test is performed under the specific conditions.
2. Set different channel and data rate being tested, and then making EUT to the following modes:
   a) The mode of continuous transmission.
   b) The receive mode.
   c) The standby mode.

1.4 Configuration of System Under Test



The tests below are carried with the EUT transmitter set at high power in TDD mode. The EUT is forced to select of output power level and channel number by computer.

1.5 Verify the Frequency and Channel

CH	1	2	3	4	5	6	7	8	9	10
0	2412	2417	2422	2427	2432	2437	2442	2447	2452	2457
1	2462	2467	2472	---	---	---	---	---	---	---

Note:

(1) This is for sure that all frequencies are in 2.4GHz – 2.4835 GHz.

(2) After test, the EUT (IEEE 802.11b/g) operating frequencies are in 2.412GHz to 2.472GHz. So all the item as followed in testing report are need to test these three frequencies: channel 1, channel 7, and channel 13.

(3) E.T.S.I (2400MHz ~ 2483.5MHz),
FRANCE outdoor use limited to 10mW e.i.r.p. within the band (2454MHz ~ 2483.5MHz)

1.6 Test Procedure

All measurements performed in this report were performed mainly according to the techniques described in ETSI EN 300328 (November, 2004) and the pre-setup was written on 1.4 test method, the detail setup was written on each test item.

1.7 Location of the Test Site

The radiated emissions measurements required by the rules were performed on the **three-meter**, **Anechoic Chamber (Registration Number: 93906)** maintained by *Training Research Co., Ltd.* 1F., No. 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. Complete description and measurement data have been placed on file with the commission. The conducted power line emissions tests and other test items were performed in a anechoic chamber also located at *Training Research Co., Ltd.*

No. 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. *Training Research Co., Ltd.* is listed by the FCC as a facility available to do measurement work for others on a contract basis.

1.8 General Test Condition

The test condition shall be as follows: (See Clause 5.3)

The NORMAL temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:

-temperature: +15℃ to +35℃;

-relative humidity: 20% to 75%.

The normal test voltage for equipment to be connected to the main shall be the nominal mains voltage.

For purpose of this ETS, the normal voltage shall be the declared voltage or any of the declared voltages for which the equipment was designed.

The frequency of the test power source corresponding to the AC mains shall be between 49Hz and 51Hz. When radio equipment is intended for operation from the usual, alternator fed lead-acid battery power source used on vehicles, then the normal test voltage shall be 1.1 times the nominal voltage of the battery (6V, 12V, etc.)

For operation from other power sources or types of battery (primary or secondary), the nominal test voltage shall be as declared by the equipment manufacturer. This shall be recorded in the test report.

For tests at EXTREME temperatures, measurements shall be made in accordance with the procedures specified in subclause 5.3.4, at the upper and lower temperatures of the range as follows:

temperature: -20℃ to +55℃;

Where the manufacturer's declared operating range does not include the range of -20℃ to +55℃, the equipment shall be tested over the following temperature ranges:

a)0℃ to +35℃ for equipment intended for INDOOR use only, or intended for use in areas where the temperature is controlled within this range;

b)Over the extremes of the operating temperature range(s) of the declared host equipment(s) in case of plug-in radio devices.

The frequency range as in subclause 5.7.4 and the e.i.r.p. Limit in subclause 4.3.3.2 shall not be exceeded.

Tests at extreme power source voltages specified below are not required when the equipment under test is designed for operation as part of and powered by another system or piece of equipment. Where this is the case, the limit values of the host system or host equipment shall apply. The appropriate limit values shall be declared by the manufacturer and recorded in the test report.

The EXTREME TEST VOLTAGE for equipment to be connected to an AC mains source shall be the nominal mains voltage ±10%.

When radio equipment is intended for operation from the usual type of alternator fed lead-acid battery power source used on vehicles, then extreme test voltage shall be 1.3 and 0.9 times the nominal voltage of the battery (6V, 12V,etc.).

The lower extreme test voltage for equipment with power source using the following type of battery, shall be:

-for the Leclanche' or lithium type battery: 0.85 times the nominal voltage of the battery;

-for the mercury or nickel-cadmium type of battery: 0.9 times the nominal voltage of the battery.

In both cases, the upper extreme test voltage shall be 1.15 times the nominal voltage of the battery.

For equipment using other power sources, or capable of being operated from a variety of power sources (primary or secondary), the extreme test voltages shall be those declared by the manufacturer; these shall be recorded in the test report. Before measurements are made the equipment shall have reached thermal balance in the test chamber.

II. Section 4.3.1: Effective Radiated Power

2.1 Test Result of Effective Radiated Power for IEEE 802.11b

Power level at which the measurement has been performed 67.98 mW

TEST CONDITION		TRANSMITTER POWER	
		Tx Ave. (dBm)	Cable Loss (dB)
Channel 1	25 °C	9.214	6.25
	0 °C	10.109	
	35 °C	8.788	
Channel 7	25 °C	9.136	6.20
	0 °C	10.124	
	35 °C	8.606	
Channel 13	25 °C	6.721	6.30
	0 °C	7.983	
	35 °C	6.124	
Limit		Tx Ave.: 20dBm / -10dBW	
Uncertainty		± 0.56dB	

NOTE:

(1) The E.U.T is a stand-alone radio device (see the clause 5.3.2.2). The powered by the adaptor. So, the AC power is used as the extreme voltage source. (See clause 5.3.4.2)

(2) The value of table is worst case during test condition, includes different combinations of transmitter rate antenna polarity and temperature

(3) Duty cycle (X): 100%.
Average power = Tx Ave. + Cable Loss + Antenna Gain (2.00dBi) = 18.324 dBm,
E.I.R.P. = Average power +10 log (1/X)
= 18.324 dBm + 0 dB
= 18.324

(4) ETSI (2400MHz ~ 2483.5MHz),
FRANCE outdoor use limited to 10mW e.i.r.p. within the band (2454MHz ~ 2483.5MHz)

2.2 Test Result of Effective Radiated Power for IEEE 802.11g

Power level at which the measurement has been performed 34.71 mW

TEST CONDITION		TRANSMITTER POWER	
		Tx Ave. (dBm)	Cable Loss (dB)
Channel 1	25 °C	5.960	6.25
	0 °C	6.896	
	35 °C	5.677	
Channel 7	25 °C	5.986	6.20
	0 °C	7.205	
	35 °C	5.721	
Channel 13	25 °C	5.487	6.30
	0 °C	6.859	
	35 °C	5.211	
Limit		Tx Ave.: 20dBm / -10dBW	
Uncertainty		± 0.56dB	

NOTE:

Duty cycle (X): 100%.

Average power = Tx Ave. + Cable Loss + Antenna Gain (2.00dBi) = 15.405 dBm,

E.I.R.P. = Average power +10 log (1/X)

= 15.405 dBm + 0 dB

= 15.405 dBm

III. Section 5.7.3: Peak Power Density

3.1 Test Result of Peak Power Density for IEEE 802.11b

Channel	Frequency (MHz)	Ppr (dBm)	CF (dB)	Ant. Gain (dB)	Ppq (dBm)	Limit (dBm)	Margin (dB)
CH 01	2412	-1.03	6.57	2.00	7.54	10.00	-2.46
CH 07	2442	-0.74	6.53	2.00	7.79	10.00	-2.21
CH 13	2472	-4.39	6.74	2.00	4.35	10.00	-5.65
Uncertainty		± 1.50dB					

3.2 Test Result of Peak Power Density for IEEE 802.11g

Channel	Frequency (MHz)	Ppr (dBm)	CF (dB)	Ant. Gain (dB)	Ppq (dBm)	Limit (dBm)	Margin (dB)
CH 01	2412	-2.02	6.57	2.00	6.55	10.00	-3.45
CH 07	2442	-1.73	6.53	2.00	6.80	10.00	-3.20
CH 13	2472	-1.87	6.74	2.00	6.87	10.00	-3.13
Uncertainty		± 1.50dB					

NOTE:

(1) For equipment using FHSS modulation, the peak power density shall be limit to –10dBW(100mW) per 100kHz E.I.R.P.

(2) For equipment using other types modulation, the peak power density shall be limit –20dBW(10mW) per MHz E.I.R.P.

(3) Ppr: spectrum read power density (using peak search mode), CF: correct factor,
CF: Correct Factor, AG: Antenna Gain
Ppq: actual peak power density in the spread spectrum band. Ppq = Ppr + CF + AG

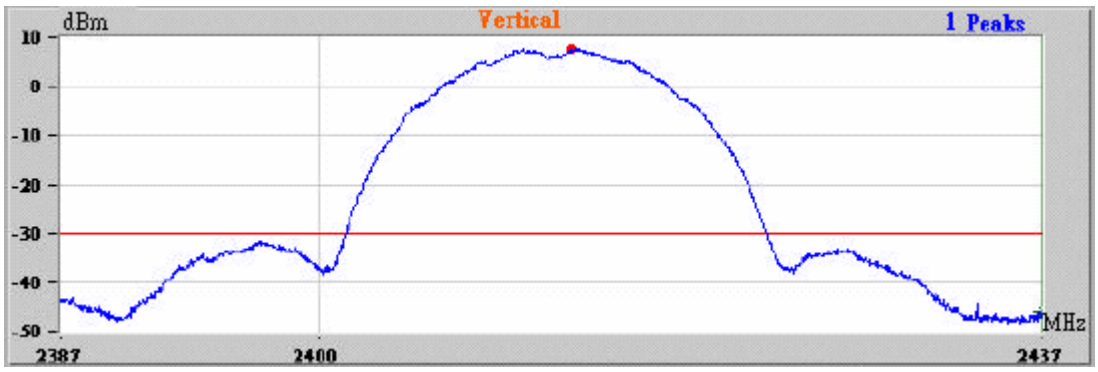
(4) The value of table is worst case during test condition, includes different combination s of transmitter rate, antenna polarity and temperature

(5) The data in the above table are summarizing the following attachment spectrum analyzer hard copy.

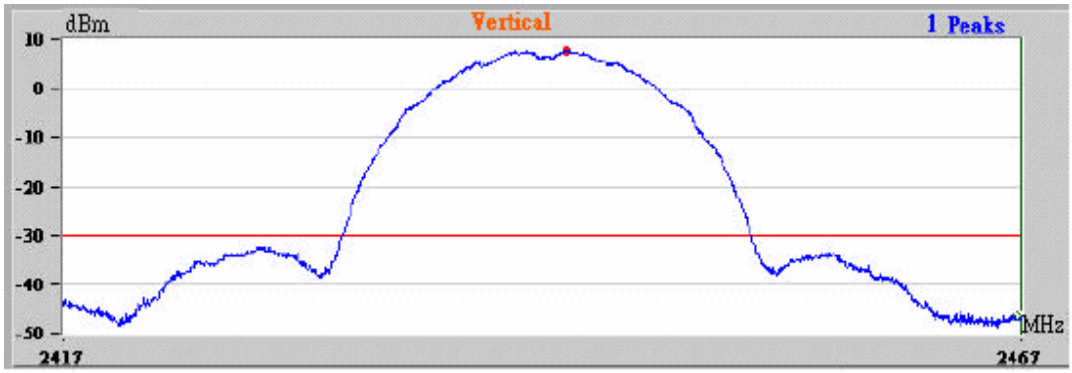
(6) ETSI (2400MHz ~ 2483.5MHz),
FRANCE outdoor use limited to 10mW e.i.r.p. within the band (2454MHz ~ 2483.5MHz)

IEEE 802.11b

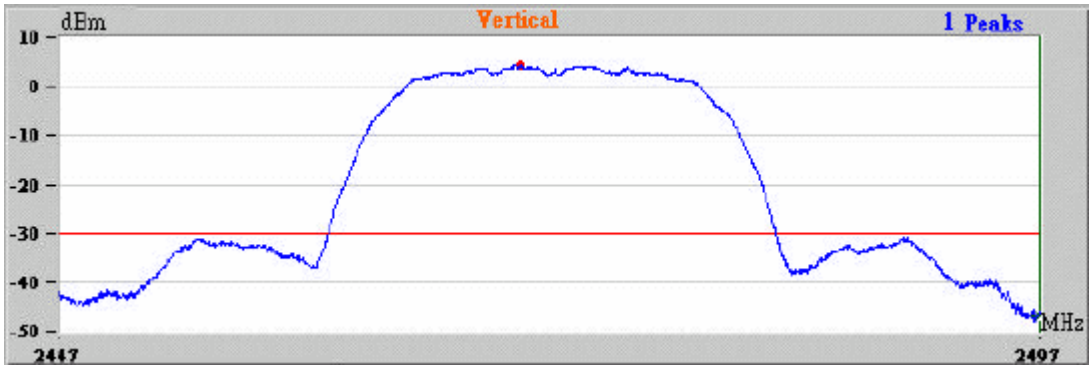
CH01



CH07

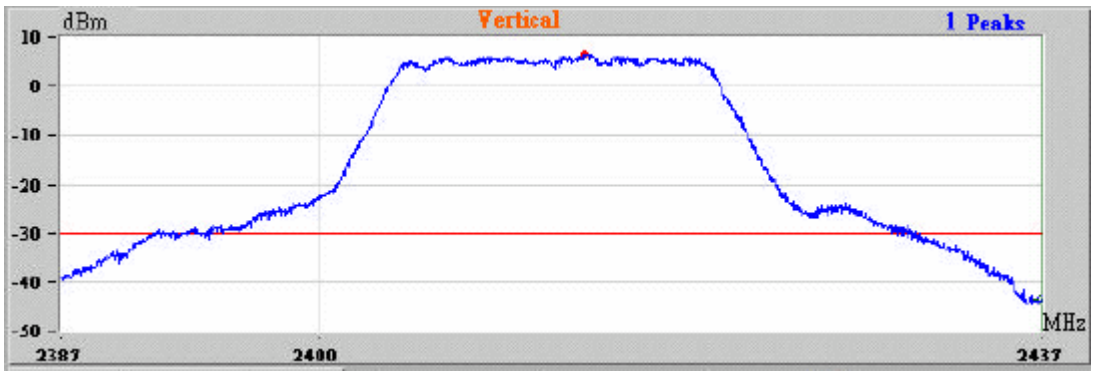


CH13

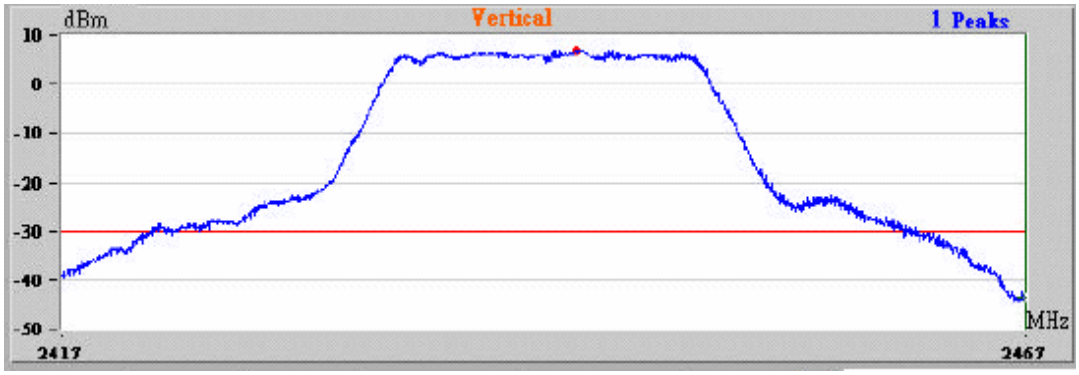


IEEE 802.11g

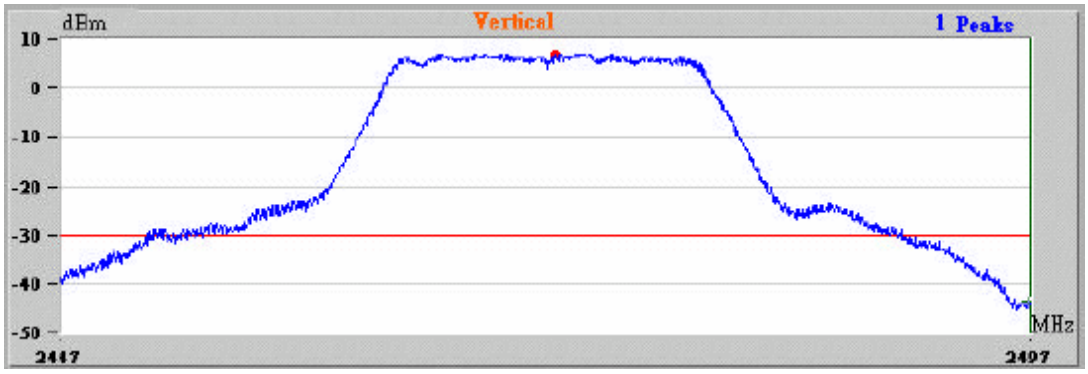
CH01



CH07



CH13



IV. Section 5.7.4 : Frequency Range

4.1 Test Result of Frequency Range for IEEE 802.11b

Transmitter Frequency Range – DSSS Equipment

TEST CONDITION		FREQUENCY(MHz)			
		Lowest Channel		Highest Channel	
		Channel 1		Channel 13	
		Frequency	Rate (Mbps)	Frequency	Rate (Mbps)
25℃	230 V	2402.00	11	2483.00	11
0℃	207 V	2402.00	11	2483.00	11
	253 V	2402.00	11	2483.00	11
35℃	207 V	2402.30	11	2483.10	11
	253 V	2402.30	11	2483.10	11
Measured frequencies (lowest and highest)		FL = 2402.00 MHz		FH = 2483.10 MHz	
Limit		FL > 2400MHz		FH < 2483.5MHz	
Uncertainty		± 1837Hz			

Note:

(1) The E.U.T is a stand-alone radio device (see the clause 5.3.2.2). This is powered by the main. So, the AC power is used as the extreme voltage source. (see clause 5.3.4.2).

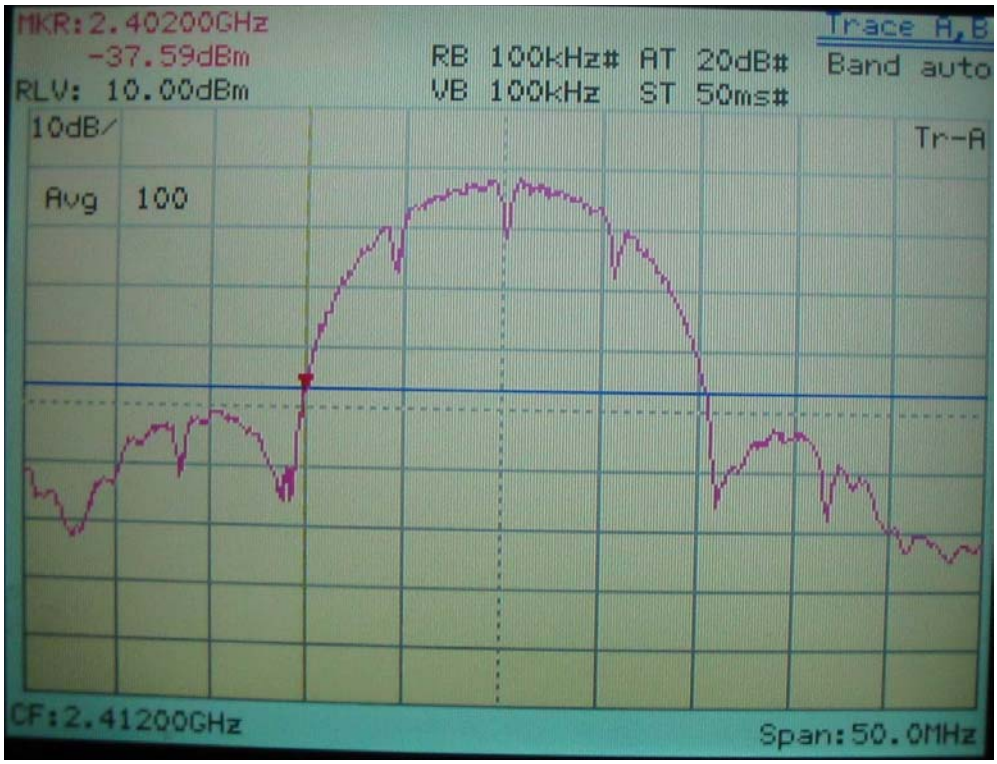
(2) B: Battery, AC: AC Source, Rate: Transmitter Rate.

(3) The value of table is worst case during test condition, includes different combinations of transmitter rate, antenna polarity and temperature.

(4) The data in the above table are summarizing the following attachment spectrum analyzer hard copy.

(5) ETSI (2400MHz ~ 2483.5MHz),
FRANCE outdoor use limited to 10mW e.i.r.p. within the band (2454MHz ~ 2483.5MHz)

Channel 01 (The lowest one in the frequency range)



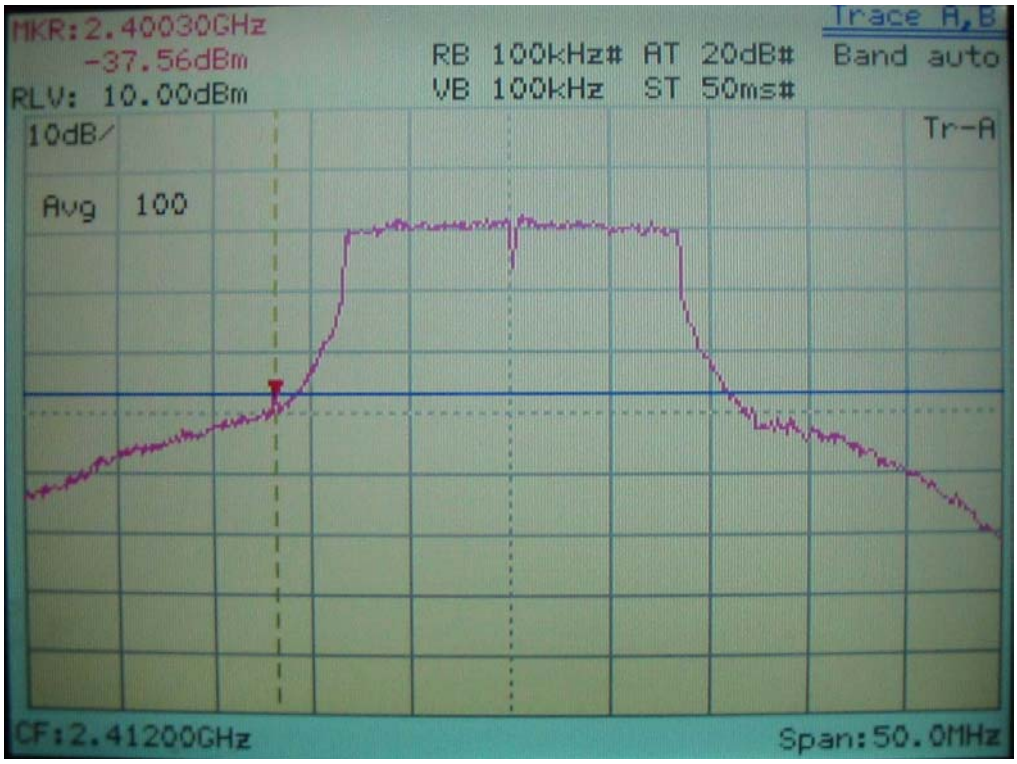
Channel 13 (The greatest one in the frequency range)

4.2 Test Result of Frequency Range for IEEE 802.11g

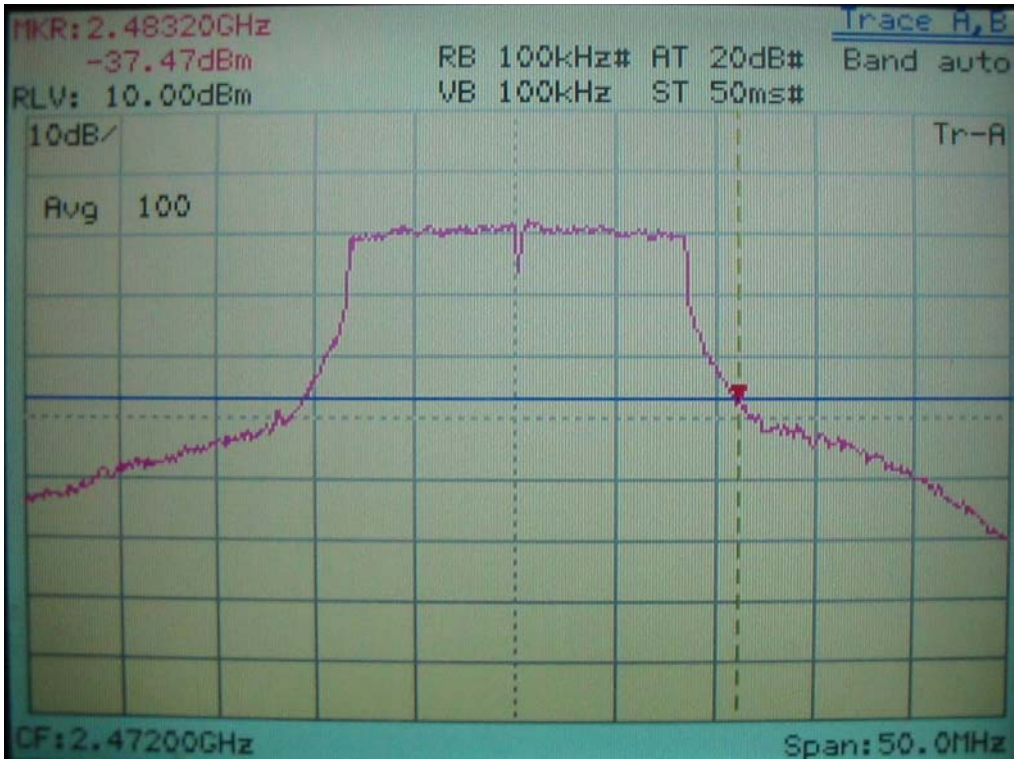
Transmitter Frequency Range – DSSS Equipment

TEST CONDITION		FREQUENCY(MHz)			
		Lowest Channel		Highest Channel	
		Channel 1		Channel 13	
		Frequency	Rate (Mbps)	Frequency	Rate (Mbps)
25℃	230 V	2401.30	54	2482.80	54
0℃	207 V	2400.30	54	2483.20	54
	253 V	2400.30	54	2483.20	54
35℃	207 V	2401.90	54	2482.60	54
	253 V	2401.90	54	2482.60	54
Measured frequencies (lowest and highest)		FL = 2400.30 MHz		FH = 2483.20 MHz	
Limit		FL > 2400MHz		FH < 2483.5MHz	
Uncertainty		± 1837Hz			

Channel 01 (The lowest one in the frequency range)



Channel 13 (The greatest one in the frequency range)



V. Section 5.7.5: Transmitter Spurious Emissions

5.1 Test Result for IEEE 802.11b

Channel 1 (30MHz to 1GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
193.69	H	-62.71	-36.00	-26.71	11
251.89	H	-62.78	-36.00	-26.78	11
291.90	H	-58.46	-36.00	-22.46	11
672.62	H	-60.76	-36.00	-24.76	11
768.41	H	-59.95	-36.00	-23.95	11
865.41	H	-60.45	-36.00	-24.45	11
154.89	V	-58.48	-36.00	-22.48	11
194.90	V	-61.69	-36.00	-25.69	11
290.69	V	-54.76	-36.00	-18.76	11
386.47	V	-61.12	-36.00	-25.12	11
768.41	V	-61.86	-36.00	-25.86	11
865.41	V	-59.25	-36.00	-23.25	11

Note:

(1) A. P. means antenna polarization, horizontal and vertical.
Amplitude means the fundamental emission measured
C F. means Correct Factor, Rate means transmitter rate
Corrected Factor (C. F.) = Cable Loss + Antenna Factor – Amplified Gain
LEVEL = Amplitude + Corrected Factor

(2) The margin is minus that means under limit.

(3) The value of table is the worst case during test condition. This is including different combinations of transmitter rate antenna polarity and temperature.

(4) ETSI (2400MHz ~ 2483.5MHz),
FRANCE outdoor use limited to 10mW e.i.r.p. within the band (2454MHz ~ 2483.5MHz)

(5) The level of confidence of 95% , the uncertainty of measurement of radiated emission is +2.85dB / -2.77dB

Channel 13 (30MHz to 1GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
145.19	H	-64.64	-36.00	-28.64	11
193.69	H	-61.25	-36.00	-25.25	11
289.47	H	-58.09	-36.00	-22.09	11
483.47	H	-64.00	-36.00	-28.00	11
672.62	H	-59.93	-36.00	-23.93	11
768.41	H	-58.88	-36.00	-22.88	11
156.10	V	-59.93	-36.00	-23.93	11
194.90	V	-60.02	-36.00	-24.02	11
289.47	V	-55.46	-36.00	-19.46	11
387.69	V	-61.18	-36.00	-25.18	11
624.12	V	-62.66	-36.00	-26.66	11
864.20	V	-58.61	-36.00	-22.61	11

Channel 1 (1GHz to 12.75GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
2583.33	H	-66.35	-30.00	-36.35	11
4825.83	H	-62.52	-30.00	-32.52	11
7234.69	H	-60.04	-30.00	-30.04	11
9647.40	H	-59.17	-30.00	-29.17	11
12060.10	H	-56.31	-30.00	-26.31	11
2531.25	V	-61.98	-30.00	-31.98	11
4825.83	V	-62.02	-30.00	-32.02	11
7234.69	V	-58.21	-30.00	-28.21	11
9647.40	V	-59.67	-30.00	-29.67	11
12060.10	V	-56.98	-30.00	-26.98	11

Channel 13 (1GHz to 12.75GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
2729.17	H	-65.29	-30.00	-35.29	11
4945.31	H	-63.09	-30.00	-33.09	11
7415.83	H	-59.09	-30.00	-29.09	11
9886.35	H	-57.75	-30.00	-27.75	11
12360.73	H	-58.89	-30.00	-28.89	11
2589.58	V	-64.66	-30.00	-34.66	11
4945.31	V	-59.43	-30.00	-29.43	11
7415.83	V	-59.92	-30.00	-29.92	11
9886.35	V	-57.58	-30.00	-27.58	11
12360.73	V	-58.73	-30.00	-28.73	11

5.2 Test Result for IEEE 802.11g

Channel 1 (30MHz to 1GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
251.89	H	-61.57	-36.00	-25.57	54
290.69	H	-58.09	-36.00	-22.09	54
672.62	H	-61.03	-36.00	-25.03	54
768.41	H	-60.00	-36.00	-24.00	54
865.41	H	-60.34	-36.00	-24.34	54
145.19	V	-57.23	-36.00	-21.23	54
194.90	V	-61.07	-36.00	-25.07	54
290.69	V	-55.06	-36.00	-19.06	54
768.41	V	-60.51	-36.00	-24.51	54
865.41	V	-59.09	-36.00	-23.09	54

Channel 13 (30MHz to 1GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
193.69	H	-62.01	-36.00	-26.01	54
290.69	H	-58.14	-36.00	-22.14	54
672.62	H	-61.35	-36.00	-25.35	54
768.41	V	-60.00	-36.00	-24.00	54
864.20	H	-59.12	-36.00	-23.12	54
146.40	V	-57.82	-36.00	-21.82	54
153.68	V	-58.18	-36.00	-22.18	54
289.47	V	-55.15	-36.00	-19.15	54
387.69	V	-60.04	-36.00	-24.04	54
865.41	V	-58.27	-36.00	-22.27	54

Channel 1 (1GHz to 12.75GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
2522.92	H	-65.67	-30.00	-35.67	54
4825.83	H	-63.36	-30.00	-33.36	54
7234.69	H	-60.21	-30.00	-30.21	54
9647.40	H	-58.67	-30.00	-28.67	54
12060.10	H	-56.65	-30.00	-26.65	54
2531.25	V	-60.98	-30.00	-30.98	54
4825.83	V	-62.69	-30.00	-32.69	54
7234.69	V	-61.04	-30.00	-31.04	54
9647.40	V	-58.83	-30.00	-28.83	54
12060.10	V	-57.15	-30.00	-27.15	54

Channel 13 (1GHz to 12.75GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
2910.42	H	-64.47	-30.00	-34.47	54
4945.31	H	-61.93	-30.00	-31.93	54
7415.83	H	-59.25	-30.00	-29.25	54
9886.35	H	-58.25	-30.00	-28.25	54
12360.73	H	-57.73	-30.00	-27.73	54
2589.58	V	-62.33	-30.00	-32.33	54
4945.31	V	-61.43	-30.00	-31.43	54
7415.83	V	-58.75	-30.00	-28.75	54
9886.35	V	-57.75	-30.00	-27.75	54
12360.73	V	-58.23	-30.00	-28.23	54

VI. Section 5.7.6: Receiver Spurious Emissions

6.1 Test Result for IEEE 802.11b

Channel 1 (30MHz to 1GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
193.69	H	-60.33	-57.00	-3.33	11
250.67	H	-59.40	-57.00	-2.40	11
289.47	H	-61.08	-57.00	-4.08	11
481.05	H	-66.91	-57.00	-9.91	11
672.62	H	-60.55	-57.00	-3.55	11
768.41	H	-60.28	-57.00	-3.28	11
156.10	V	-57.55	-57.00	-0.55	11
243.40	V	-61.93	-57.00	-4.93	11
289.47	V	-58.55	-57.00	-1.55	11
483.47	V	-61.90	-57.00	-4.90	11
768.41	V	-61.38	-57.00	-4.38	11
865.41	V	-58.29	-57.00	-1.29	11

Note:

(1) A. P. means antenna polarization, horizontal and vertical.
Amplitude means the fundamental emission measured.
C F. means Correct Factor, Rate means transmitter rate
Corrected Factor (C. F.) = Cable Loss + Antenna Factor – Amplified Gain
LEVEL = Amplitude + Corrected Factor

(2) The value of table is worst case during test condition, includes different combinations of transmitter rate antenna polarity and temperature

(3) ETSI (2400MHz ~ 2483.5MHz),
FRANCE outdoor use limited to 10mW e.i.r.p. within the band (2454MHz ~ 2483.5MHz)

(4) The level of confidence of 95% , the uncertainty of measurement of radiated emission is +2.85dB / -2.77dB

Channel 13 (30MHz to 1GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
147.61	H	-65.50	-57.00	-8.50	11
194.90	H	-60.26	-57.00	-3.26	11
254.31	H	-58.93	-57.00	-1.93	11
290.69	H	-60.59	-57.00	-3.59	11
672.62	H	-60.30	-57.00	-3.30	11
768.41	H	-61.52	-57.00	-4.52	11
153.68	V	-57.39	-57.00	-0.39	11
193.69	V	-61.30	-57.00	-4.30	11
243.40	V	-61.23	-57.00	-4.23	11
290.69	V	-58.79	-57.00	-1.79	11
768.41	V	-61.91	-57.00	-4.91	11
865.41	V	-57.48	-57.00	-0.48	11

Channel 1 (1GHz to 12.75GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
1817.60	H	-65.04	-47.00	-18.04	11
2973.02	H	-64.52	-47.00	-17.52	11
4995.00	H	-61.41	-47.00	-14.41	11
7095.31	H	-62.29	-47.00	-15.29	11
1793.12	V	-68.27	-47.00	-21.27	11
3609.48	V	-63.32	-47.00	-16.32	11
5465.00	V	-60.81	-47.00	-13.81	11
7873.75	V	-61.79	-47.00	-14.79	11

Channel 13 (1GHz to 12.75GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
1631.56	H	-66.74	-47.00	-19.74	11
2791.87	H	-65.59	-47.00	-18.59	11
4706.15	H	-61.93	-47.00	-14.93	11
7824.79	H	-61.83	-47.00	-14.83	11
2184.79	V	-66.75	-47.00	-19.75	11
3937.50	V	-62.79	-47.00	-15.79	11
6028.02	V	-63.82	-47.00	-16.82	11
8451.46	V	-61.17	-47.00	-14.17	11

6.2 Test Result for IEEE 802.11g

Channel 1 (30MHz to 1GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
194.90	H	-59.78	-57.00	-2.78	54
251.89	H	-59.55	-57.00	-2.55	54
289.47	H	-60.84	-57.00	-3.84	54
672.62	H	-61.01	-57.00	-4.01	54
865.41	H	-61.12	-57.00	-4.12	54
156.10	V	-58.08	-57.00	-1.08	54
243.40	V	-62.37	-57.00	-5.37	54
291.90	V	-58.56	-57.00	-1.56	54
768.41	V	-61.59	-57.00	-4.59	54
865.41	V	-57.39	-57.00	-0.39	54

Channel 13 (30MHz to 1GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
194.90	H	-60.02	-57.00	-3.02	54
253.10	H	-58.57	-57.00	-1.57	54
289.47	H	-60.31	-57.00	-3.31	54
672.62	H	-60.76	-57.00	-3.76	54
768.41	H	-61.08	-57.00	-4.08	54
154.89	V	-57.75	-57.00	-0.75	54
193.69	V	-62.53	-57.00	-5.53	54
243.40	V	-62.51	-57.00	-5.51	54
291.90	V	-58.63	-57.00	-1.63	54
865.41	V	-58.24	-57.00	-1.24	54

Channel 1 (1GHz to 12.75GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
1822.50	H	-65.96	-47.00	-18.96	54
2855.52	H	-65.33	-47.00	-18.33	54
5538.44	H	-60.13	-47.00	-13.13	54
8426.98	H	-61.61	-47.00	-14.61	54
1440.62	V	-67.59	-47.00	-20.59	54
2855.52	V	-65.33	-47.00	-18.33	54
4931.35	V	-61.39	-47.00	-14.39	54
7780.73	V	-61.53	-47.00	-14.53	54

Channel 13 (1GHz to 12.75GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
1631.56	H	-64.24	-47.00	-17.24	54
2855.52	H	-65.33	-47.00	-18.33	54
5039.06	H	-61.33	-47.00	-14.33	54
7893.33	H	-62.09	-47.00	-15.09	54
1861.67	V	-67.50	-47.00	-20.50	54
2855.52	V	-65.33	-47.00	-18.33	54
5357.29	V	-61.19	-47.00	-14.19	54
8456.35	V	-62.02	-47.00	-15.02	54

6.3 Test Result for Standby mode

(30MHz to 12.5GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
193.08	H	-61.56	-57.00	-4.56	---
251.28	H	-58.31	-57.00	-1.31	---
288.26	H	-58.35	-57.00	-1.35	---
672.62	H	-58.57	-57.00	-1.57	---
768.41	H	-58.81	-57.00	-1.81	---
864.81	H	-59.56	-57.00	-2.56	---
1631.56	H	-66.24	-47.00	-19.24	---
3159.06	H	-63.94	-47.00	-16.94	---
5362.19	H	-63.67	-47.00	-16.67	---
7859.06	H	-61.64	-47.00	-14.64	---
153.68	V	-63.45	-57.00	-6.45	---
192.47	V	-63.59	-57.00	-6.59	---
219.76	V	-62.63	-57.00	-5.63	---
481.05	V	-63.73	-57.00	-6.73	---
672.62	V	-60.57	-57.00	-3.57	---
864.20	V	-58.61	-57.00	-1.61	---
1817.60	V	-67.04	-47.00	-20.04	---
3173.75	V	-63.91	-47.00	-16.91	---
4955.83	V	-61.60	-47.00	-14.60	---
7658.33	V	-61.12	-47.00	-14.12	---

VII. Instrument and Ancillaries Equipment of List

				Calibration Date
Instrument Name	**Model**	**Brand**	**Serial No.**	**Next time**
EMI Receiver	8546A	HP	3520A00242	09/06/07
RF Filter Section	85460A	HP	3448A00217	09/06/07
Small Biconical Antenna	UBAA9114 & BBVU9135	SCHWARZECK	127	12/07/07
Pre-amplifier	PA1F	TRC	1FAC	05/20/07
Auto Switch Box (>30MHz)	ASB-01	TRC	9904-01	05/20/07
Coaxial Cable (Double shielded, 15 meter)	A30A30-0058-50FS-15M	JYEBAO	SMA-01	05/20/07
Coaxial Cable (1.1 meter)	A30A30-0058-50FS-1M	JYEBAO	SMA-02	05/20/07
Spectrum Analyzer	8564E	HP	3720A00840	12/11/07
Microwave Preamplifier	84125C	HP	US36433002	11/18/07
Horn Antenna	3115	EMCO	9104-3668	02/05/08
Standard Guide Horn Antenna	84125-80008	HP	18-26.5GHz	12/12/07
Standard Guide Horn Antenna	84125-80001	HP	26.5-40GHz	12/12/07
Horn Antenna	1196E (3115)	HP (EMCO)	9704-5178	02/12/08
Pre-amplifier	PA2F	TRC	2F1GZ	06/20/07
Coaxial Cable (3 miter)	A30A30-0058-50FST118	JYEBAO	MSA-05	06/20/07
Coaxial Cable (1 meter)	A30A30-0058-50FST118	JYEBAO	MSA-04	06/20/07

Appendix A

Antenna Specification

料件承認書

文件編號：		版本：1.0
品號：	1602020019400	製造商： 寰波
品名：	Dual-Band Omni-Directional Antenna	
規格：		
適用產品：	2.4/ 5.0/ 5.2/ 5.6/ 5.8GHz	
附件：	☐ 1.系列承認清單 ☐ 2.Moxa 內部測試報告 ✓ 3.廠商承認書 ☐ 4.UL 認證報告 ☐ 5 CSA 認證報告 ☐ 6.TUV 認證報告	
	✓ 7.RoHS 認證報告/RepNo. CE/2004/A1528 CE/2006/10629 KA/2005/40650 CE/2006/63956 CE/2004/C1498 CE/2006/63959 CE/2005/83039 CE/2004/53035 CE/2006/41802 CE/2006/47581 KE/2005/41696 CE/2004/B4117A CE/2005/92596A CE/2005/92597A CE/2006/14801A KE/2006/20995 ☐ 8. SONY 認證報告/RepNo. /自我	

核准：洪誠	審核：洪誠	撰寫：明松			發 行 章
相 關 單 位 會 簽					
				品保	
				家齊	

品號	版本	修訂內容	修訂原因	日期	修訂者
1602020019400	1.0	新料件承認		09-12-06	明松

料件檢驗標準

品號	1602020019400	品名	Dual-Band Omni-Directional Antenna	規格	2.4/ 5.0/ 5.2/ 5.6/ 5.8GHz

料件承認作業確認

1. 電氣功能之驗証 ✔ 已完成 ☐未執行，原因：
2. 實體組裝之測試 ✔ 已完成 ☐未執行，原因：
3. 執行生產可行性評估 ☐ 已完成 ✔未執行，原因：
4. 檢查供應商所附文件是否完整 ✔ 已完成 ☐未執行，原因：
5. 檢驗綠色料件標準 ✔ 符合 RoHS ☐符合 SONY ☐非綠色料件

檢驗項目

尺寸(含公差)部份

☐說明如下(單位標示公制) ✔如附之尺寸圖

Mechanism size Check/Compare (單位 ：mm)

項次	檢驗項目	檢驗方法	規格	公差	圖面位置	實測 1	實測 2	實測 3	實測 4
1									
2									
3									
4									
5									
6									
7									
8									
9									

顏色部份

顏色：

可參考：✔sample ☐附件之色板

外觀印刷規格說明

圖案之大小、顏色、位置－ ☐如下說明 ✔參考所附文件

文字之大小、顏色、位置、字型－ ☐如下說明 ✔參考所附文件

原物料封裝及包裝說明

IC 封裝方式：

料件包裝方式：25 支裝一包,20 包裝一紙箱

特殊檢驗要求

IC 版本：

IC 外觀標示圖與標註檢驗項目：

其它注意事項

操作溫度 ：-10~55℃

Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 2

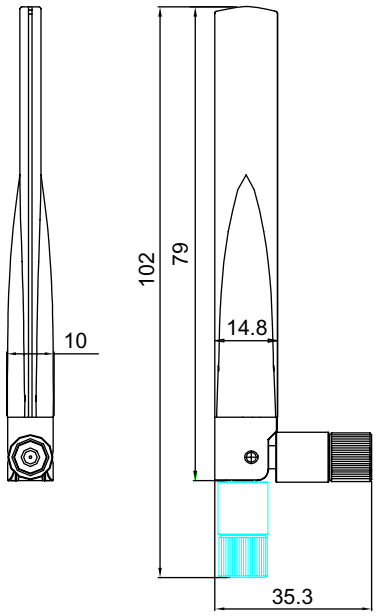
SAA05-220420

Electrical Specification

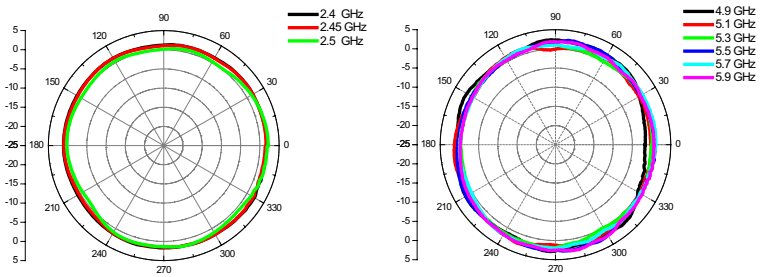
Frequency range	2400 MHz - 2500 MHz	4900 MHz - 5875 MHz
Peak Gain	2 dBi	2 dBi
Average Gain	1 dBi	1 dBi
VSWR	2.0 : 1 Max.	2.0 : 1 Max.
HPBW / horizontal	360°	360°
HPBW / vertical	80°	80°
Polarization	Linear, vertical	Linear, vertical
Power handling	2 W (cw)	2 W (cw)
Impedance	50 Ohms	50 Ohms
Connector	RP SMA Plug	

Environmental & Mechanical Characteristics

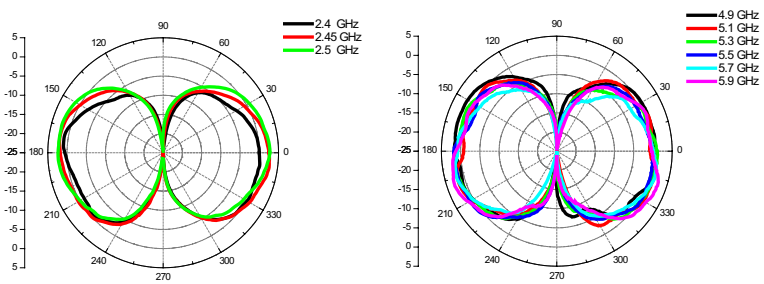
Temperature	- 10° C to +55° C
Humidity	95% @ 55° C
Radome color	Black
Weight	9 g
Dimensions	79 x 35.3 x 10 mm



H-plane Co-polarization Pattern



V-plane Co-polarization Pattern



http:// www.smartant.com TEL: +886 (0)3 583-6000 FAX: +886 (0)3 583-7000 E-mail: service@smartant.com

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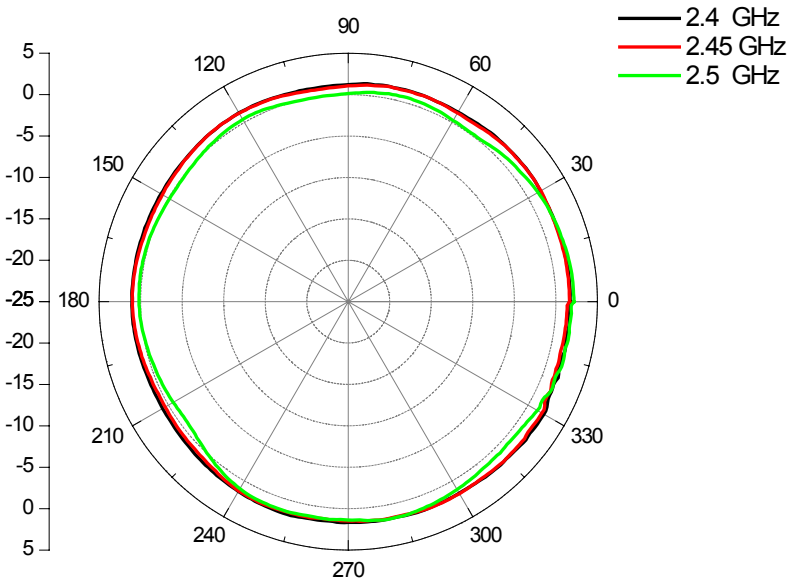
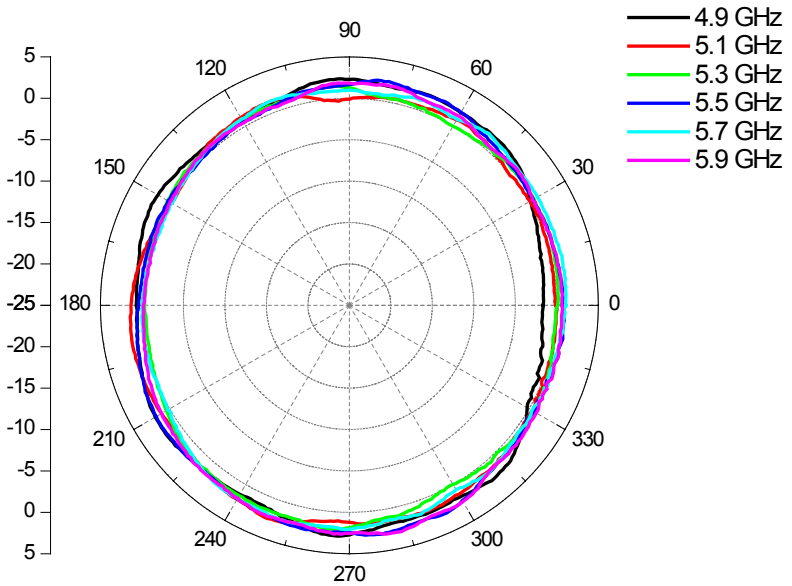
SAA05-220420

Radiation Pattern (1/2)

H-plane Co-polarization Pattern





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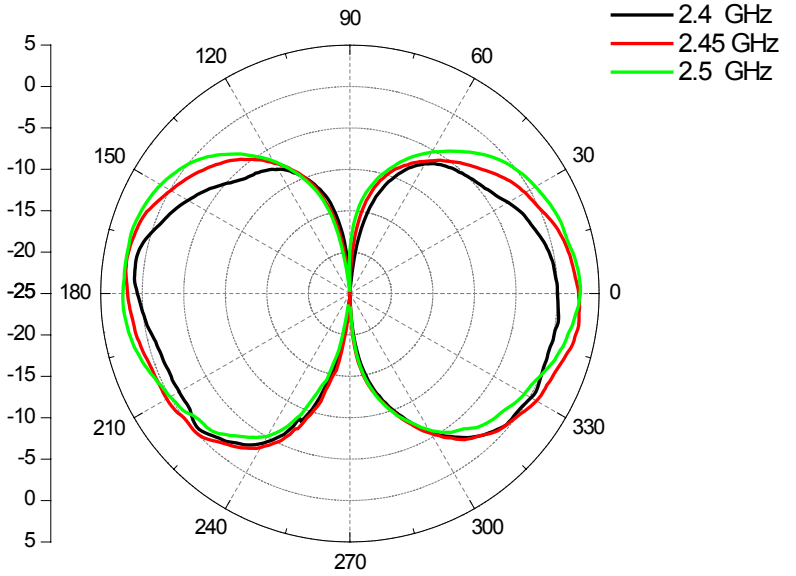
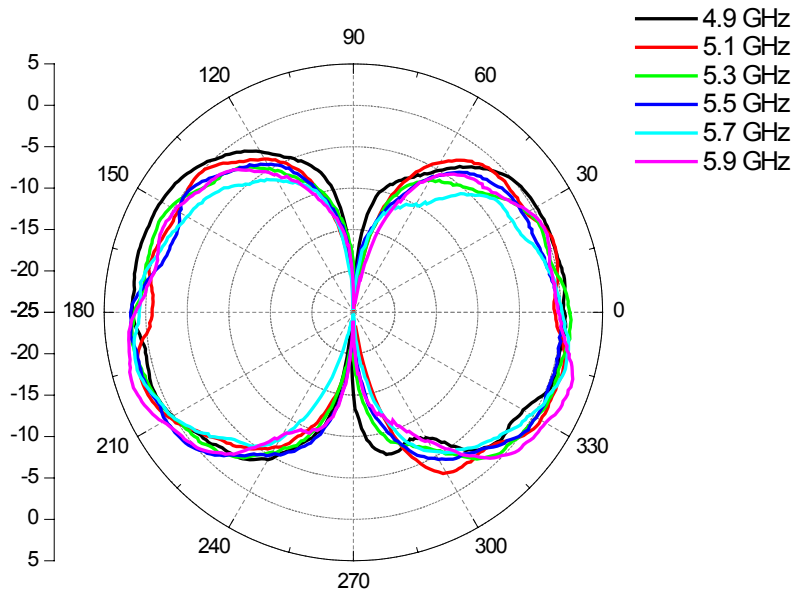
SAA05-220420

Radiation Pattern (2/2)

V-plane Co-polarization Pattem





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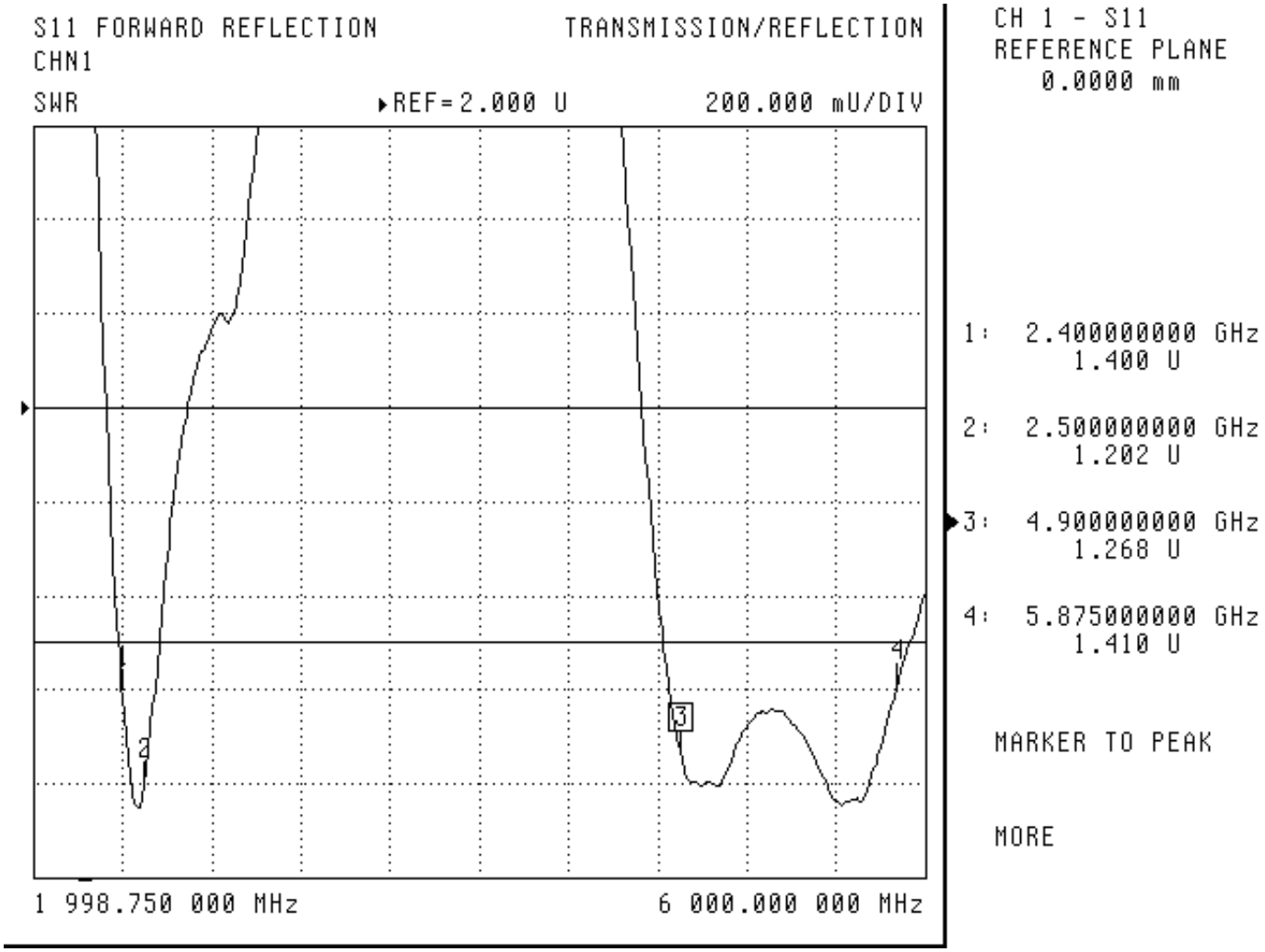
SAA05-220420

VSWR



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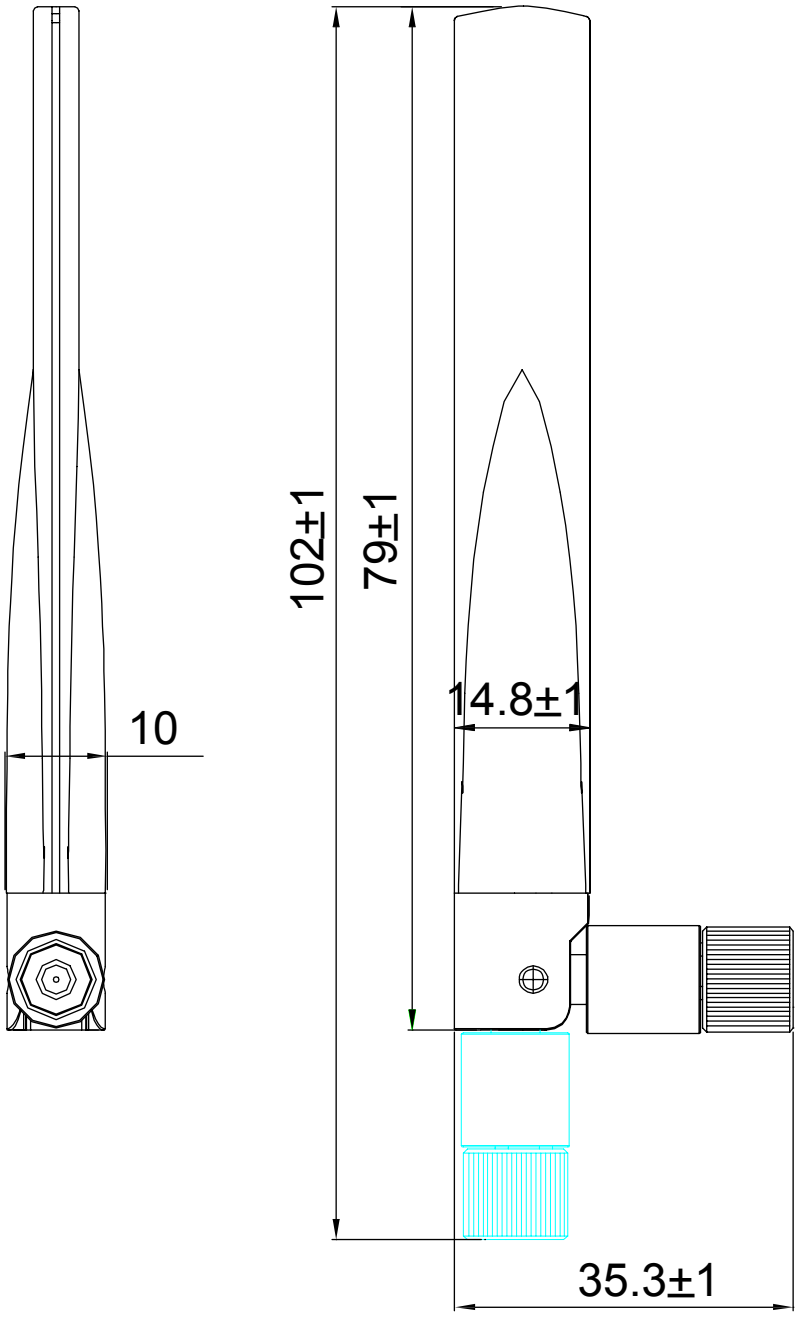
SAA05-220420

Product Drawing



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Reliability Test Report (1/2)

寰波科技股份有限公司

SmartAnt Telecom Co.,Ltd.

Reliability Test Report

Model： SAA05-220420

Product Name：Dual-Band Omni-Directional Antenna

Nickname：小小王子

Frequency：2.4GHz~2.5GHz
4.9GHz~5.875GHz

VSWR：2.0：1 Max

Test Results：■ PASS □ NG

Approved By	Review By	Prepared By

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Reliability Test Report (2/2)

Reliability Test Result :

	Test Group		A					Judgment
	Test Sample No.		01	02	03	04	05	
Test Flow	1	Composite Temperature/Humidity Cycling Test	○	○	○	○	○	PASS
	2	Cold Test	○	○	○	○	○	PASS
	3	High Temperature Test	○	○	○	○	○	PASS
	4	Pull Force	○	○	○	○	○	NA
	5	Angel Measurement	○	○	○	○	○	PASS

Conclusion: All visual inspection is normal and function is ok.

Reliability Test Specification:

No	Test Item	Duration	Temperature	Refer to standard	Note
1	Composite Temperature/Humidity Cycling Test	65hr	-10~55℃ 95%RH	IEC 68-2-30	NA
2	Cold Test	50hr	-10℃	IEC 68-2-1	NA
3	High Temperature Test	50hr	55℃	IEC 68-2-2	NA
4	Pull Force	EA/Time	23±5℃	Smartant Standard	NA
5	Angel Measurement	EA/Time	23±5℃	Smartant Standard	NA

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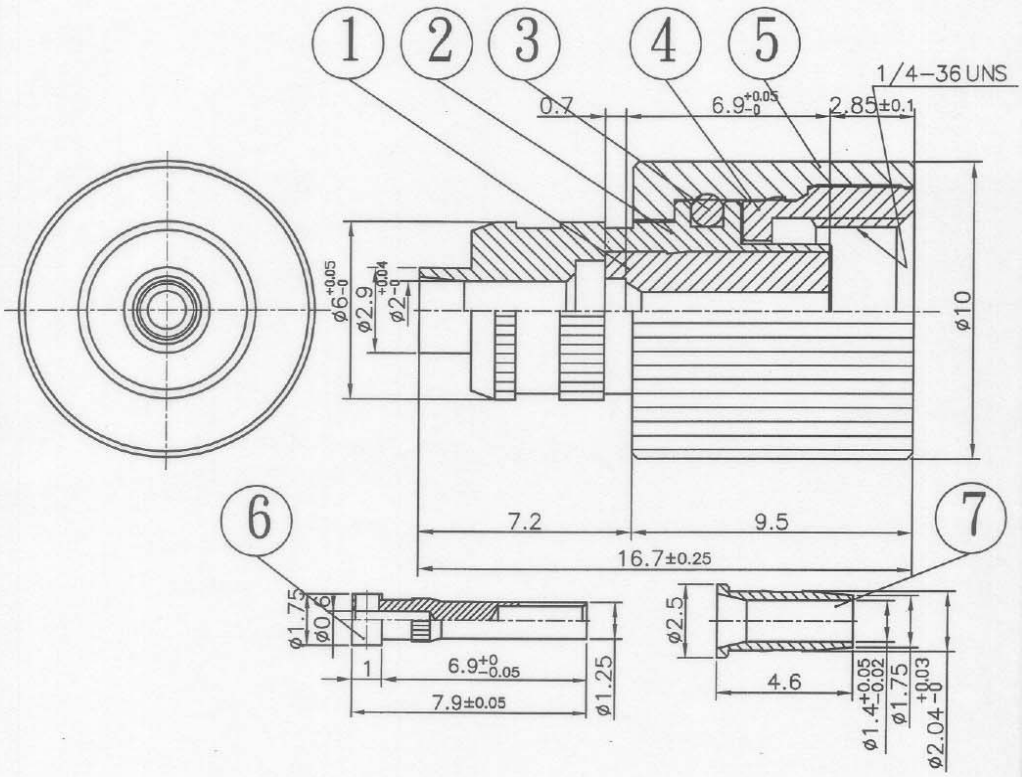
SAA05-220420

Material Approval - Connector (1/7)

REV:1

NO.	REV' NO.	DATE	NOTE	REV' BY	APPROVED	REMARK
⚠						
⚠						



NOTE:
1. PATENT PENDING
2. GENERAL TOLERANCE: ±0.1mm

Q'TY	NO.	DWG. NO.	PART NAME	MATL	REMARK
1	7	XAE4B035	RP-SSMA-PIN	PHOS.BRZN	Gold 1u"
1	6	XAF4B034	RP-SSMA-E	BRASS	Gold 1u"
1	5		SSMA-D-X1	DELRIN	Black
1	4		SSMA-A-X	BRASS	Gold 1u"
1	3		SSMA-O	NBR	Black
1	2		SSMA-B-X	BRASS	Gold 1u"
1	1		RP-SSMA-P	HD.PE	

SCALE	MATL	FINISHED	ASS'Y	
5/1				
THIRD ANGLE	UNIT mm		PART NAME	RP-SSMA-BL
APPROVED	CHECKED			DWG. NO. XAA4C626
John 92.10.27	Irven 92.10.27	LILY 92.10.27		

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Material Approval - Connector (2/7)

REV:1

SPECIFICATIONS		
VOLTAGE WITHSTANDING	AC500V	
CURRENT RATING	1A	
IMPEDANCE	50Ω	REMARK
FREQUENCY RANGE	6 GHz	
CABLE TYPE	RG 178	
WEIGHT		

STANDARD SPEC

NO	ITEM	CONDITION	SPEC.				CHECK(1)	
			MAX	MIN	UNIT	TIME	A	B
1	THREAD	USE GO –NO GO GAUGE TEST					–	○
2	INSULATION RESISTANCE	DC 500V, >5000 MΩ		5000	MΩ		–	○
3	VSWR	6 GHz, ≦1.5	1.5				–	○
4	Salt Spray	Min. 48 Hours		48	hrs		–	○
5	TEMPERATURE RANGE	-20℃~85℃						
6	-	-	-					

PART NAME	CONTROL NO.	RECORD	CHECK	APPROVED
RP SSMA-BL		Lily 10/6-03'	Irven 10/6-03'	John 10/7-03'
DWG. NO.	ASS'Y DWG. NO.			

(1) A : OFTEN CHECK B : REGULAR CHECK

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Material Approval - Connector (3/7)

宮前五金股份有限公司 REV:1

BRASS 黃銅材質

檢驗報告表

編號:：　　91年4月22日

客　戶			
品　名		FREE CUTTING BRASS ROD	
規　格		JIS H3250 C3604 BD	
項目 \ 數據		成份含量	備　註
化學成份%	Cu	57.0 - 61.0	
	pb	1.8 - 3.7	
	Fe	< 0.5	
	Sn+Fe	< 1.2	
	Zn	REMAINDER	
其它			

宮前五金股份有限公司 TEL:(03)3282411-5

桃園縣龜山鄉頂湖一街 24號　TEL: (03) 3283055-70

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SAA05-220420

Material Approval - Connector (4/7)

宮前五金股份有限公司 REV:1

BRASS 黃銅材質

檢驗報告表

編號:

91年4月22日

客戶			
品名	FREE CUTTING BRASS ROD		
規格	JIS H3250 C3604 BD		
項目 \ 數據		成份含量	備註
化學成份%	Cu	57.0 - 61.0	
	pb	1.8 - 3.7	
	Fe	< 0.5	
	Sn+Fe	< 1.2	
	Zn	REMAINDER	
其它			

宮前五金股份有限公司 TEL:(03)3283211-5

桃園縣龜山鄉頂湖一街 24 號 TEL: (03) 3283065-70

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Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 2

SAA05-220420

Material Approval - Connector (5/7)

HDPE 射出

USI

UNITHENE® 聯塑烯 **HIGH DENSITY POLYETHYLENE RESINS**

高密度聚乙烯塑膠原料

產品 Products / 物性 Physical Properties	單位 UNIT	檢驗方法 TEST METHOD (ASTM)	擠壓 Extrusion	射出成型 Injection Molding						迴轉成型 Rotomolding
			LH901	LH606	LH606-13	LH614	LH506	LH514	LH523	LH405
主要用途 MAIN APPLICATIONS			•扁絲加工 •粗圓絲加工 •薄膜與平板擠壓 •Flat yarn •Coarse monofilament •Film & Sheet extrusion	•射出成型 •細圓絲加工 •Injection molding •Fine monofilament	•射出成型(用於製造塑膠箱) •Injection molding for crate	•射出成型 •鑄膜擠壓 •Injection molding •Casting	•射出成型 •Injection molding	•射出成型 •鑄膜擠壓 •Injection molding •Casting	•射出成型 •Injection molding	•迴轉成型 •射出成型 •Rotation molding •Injection molding
熔融指數 MELT INDEX	克/10分 g/10min	D1238	0.95	6.0	6.0	12	6.0	12	23	6.0
密度 DENSITY	克/立方公分 g/cm³	D1505	0.953	0.962	0.962	0.962	0.955	0.956	0.956	0.938
降伏點抗張強度 YIELD POINT TENSILE STRENGTH A.模片(MOLDED) B.吹膜(BLOWN FILM) MD*/TD**	公斤/平方公分 kg/cm²	D638 D882	A. 250 B. —	A. 310 B. —	A. 320 B. —	A. 310 B. —	A. 250 B. —	A. 250 B. —	A. 230 B. —	A. 230 B. —
斷裂點抗張強度 BREAK POINT TENSILE STRENGTH A.模片(MOLDED) B.吹膜(BLOWN FILM) MD*/TD**	公斤/平方公分 kg/cm²	D638 D882	A. 300 B. —	A. 220 B. —	A. 220 B. —	A. 150 B. —	A. 290 B. —	A. 180 B. —	A. 290 B. —	A. 240 B. —
伸長率 ELONGATION A.模片(MOLDED) B.吹膜(BLOWN FILM) MD*/TD**	百分率 %	D638 D882	A. 1100 B. —	A. 600 B. —	A. 620 B. —	A. 170 B. —	A. 760 B. —	A. 550 B. —	A. 300 B. —	A. 1100 B. —
抗衝擊強度 IZOD IMPACT STRENGTH	公斤力公分/公分 kg-cm/cm	D256	55	7.0	7.0	3.5	11	4.0	3.5	8.0
彈性係數(模片) 1% SECANT MODULUS (MOLDED)	公斤/平方公分 kg/cm²	D638	7400	9900	10000	10000	8400	7800	7600	6800
扭轉剛性 TORSIONAL STIFFNESS	公斤/平方公分 kg/cm²	D1043	6100	12500	12500	12100	10000	9600	9200	5800
彎曲剛性 FLEXURAL STIFFNESS	公斤/平方公分 kg/cm²	D747	11000	9900	9900	9800	9200	8300	8200	6600
低溫脆裂溫度 LOW TEMPERATURE BRITTLENESS	原/半數破壞 °C /F50*	D746	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76
維氏軟化溫度 VICAT SOFTENING TEMPERATURE	度 °C	D1525	125	127	127	126	125	125	125	115
熔點 MELTING POINT	度 °C	D2117	130	131	131	131	129	129	128	125
硬度 HARDNESS	蕭氏 D Shore D	D2240	68	69	69	69	68	68	68	62

*F50=50% failure
+MD : Machine Direction
++TD : Transverse Direction

50%破裂或脆裂
縱向：加工方向
橫向：橫切方向

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公元二 00 一年六月發行
ISSUED IN June 2001

REV:1

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Material Approval - Connector (6/7)

REV:1

Home | What's New | Product | Company

Polyplastics Product lines> POM(TEPCON) Grade Line-Up

Product
Product Lines
POM(TEPCON)
Brand Name List

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▶POM(TEPCON) Polyplastics Taiwan Co., Ltd. 台湾宝

POM(TEPCON) Grade Line-Up(ISO)

Item	Unit	Testing Method	M25	M90	M130	Standard M270	M3
			High Viscocity	General	High Fluidity	High Fluidity·High Cycle	High Fluidity Cycle
Density	g/cm³	ISO 1183	1.41	1.41	1.41	1.41	1.4
Stress at yield	MPa	ISO 527-1, 2	59	62	62	63	6:
Strain at break	%	ISO 527-1, 2	40*	35*	33*	30*	28
Tensile modulus	MPa	ISO 527-1, 2	2,500	2,700	2,700	2,800	2,8
Flexural strength	MPa	ISO 178	81	87	87	88	8
Flexural modulus	MPa	ISO 178	2,350	2,500	2,500	2,550	2,5
Charpy notched impact strength	kJ/m²	ISO 179/1eA	8.0	6.0	5.5	5.3	5.
Temperature of deflection under load (1.80MPa)	°C	ISO 75-1, 2	90	95	100	100	10
Coefficient of linear thermal expansion (23-55°C) Parallel	×10-5/°C	ISO 11359-2	13	12	11	11	1
Coefficient of linear thermal expansion (23-55°C) transverse	×10⁻⁵/°C	ISO 11359-2	12	12	11	11	1
Electric strength	kV/mm	IEC 60243-1	19	19	19	19	1
Volume resistivity	Ohm·cm	IEC 60093	1×10¹⁴	1×10¹⁴	1×10¹⁴	1×10¹⁴	1×1
Surface resistivity	Ohm	IEC 60093	1×10¹⁶	1×10¹⁶	1×10¹⁶	1×10¹⁶	1×1
Comparative tracking index	CTI	IEC 60112	600+	600+	600+	600+	60
Arc resistance (UL)	s	—	—	—	—	—	—
Flammability	—	UL94	HB	HB	HB	HB	H

DELRIN 材質.

* Nominal strain at break

- All figures in the table are the typical values of the material and not the minimu the material specifications.
- For qualified values of UL (Underwriters Laboratories Inc.) refer to the yellow No.E146187) issued by UL

1)Please note that these···

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Material Approval - Connector (7/7)

FAX NO. =

P. 002 REV:1

NANCAR®

NBR

NBR 特性

POLYMER DATA

NANCAR® 1051

NANCAR® 1051 rubber is a cold polymerized, high acrylonitrile copolymer with excellent oil resistance. This polymer has excellent processing characteristics in compounds where improved flow and knitting are desired and is especially valuable in high durometer compounds.

NANCAR® 1051 rubber provides good processing and building tack. It is suggested for use in molded goods, friction stock and similar applications.

POLYMER PROPERTIES

	Typical Value
Bound acrylonitrile, %	41
Mooney viscosity, ML_{1+4} @ 100 ℃	68
Heat loss, %	0.4
Ash, %	0.6
Specific gravity,	1.00
Solubility in MEK, %	100
Stabilizer,	Slight staining

COMPOUND PROPERTIES

	Cured @ 150 ℃ Minutes	Typical Value
Compound mooney, ML_{1+4} @ 100 ℃	—	85
Mooney scorch, large rotor, @ 125 ℃		
Minimum viscosity	—	51
Minutes to 5 points rise, t_5	—	27.5
Minutes to 35 points rise, t_{35}	—	32.0
Tensile strength, kg / cm²	40	255
Elongation, %	40	480
Modulus at 300 % elongation, kg / cm²	20	124
	40	156
	60	166
Hardness, Durometer A, points	40	72
Compression set, @ 100 ℃ × 70hours, %	60	58

TEST RECIPE ASTM D-3187

	Parts
NANCAR 1051	100.00
NBS 370 Znic oxide	3.00
Sulfur, 2 % $MgCO_3$ coated	1.50
NBS 372 Stearic acid	1.00
NBS 378 HAF black	40.00
NBS 384 TBBS	0.70
Total	146.20

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Dual-Band Omni-Directional Antenna for 2.4 / 5.0 / 5.2 / 5.6 / 5.8 GHz

Version 2

SAA05-220420

Material Approval - Radome

ABS Characteristics

POLYLAC

特性 Typical Proper	試驗法 ASTM Test	單位 Units	一般級(General Purpose)						防火級(Flame Retardant)					耐熱級(Hifh Heart)		
			PA-707	PA-757	PA-717C	PA-727	PA-747	PA-709	PA-765	PA-765A	PA-765B	PA-764	PA-764B	PA-777B	PA-777D	PA-777E
引張強度 Tensile Strenght	D-638	kg/cm² (lb/in²)	500 (7,090)	480 (6,800)	450 (6,380)	485 (6,870)	385 (5,470)	400 (5,670)	690 (5,530)	400 (5,670)	400 (5,670)	370 (5,250)	430 (6,100)	430 (6,100)	440 (6,240)	440 (6,240)
延伸率 Tensile Elongation	D-638	%	15	20	25	20	30	40	15	15	25	15	20	15	15	10
彎曲彈性率 Flexural Modulus	D-790	10^4 kg/cm² (10^4 lb/in²)	2.9 (4.1)	2.7 (3.8)	2.5 (3.5)	2.7 (3.8)	2.2 (3.1)	2.3 (3.2)	2.1 (3.0)	2.3 (3.2)	2.4 (3.4)	2.0 (2.8)	2.3 (3.2)	2.4 (3.4)	2.5 (3.5)	2.5 (3.5)
彎曲強度 Flexural Strenght	D-790	10^4 kg/cm² (10^4 lb/in²)	860 (12,200)	790 (11,200)	720 (10,200)	780 (11,000)	620 (8,800)	640 (9,070)	620 (8,800)	640 (9,070)	650 (9,200)	590 (8,360)	660 (9,370)	700 (9,920)	750 (10,630)	750 (10,630)
洛氏硬度 Rockwell Hardness	D-790		R-116	R-116	R-115	R-110	R-108	R-102	R-100	R-100	R-102	R-96	R-102	R-112	R-115	R-115
IZOD衝擊強度 (NOTCHED) IZOD Impact Strenght)	D-256	1/8" kg-cm/cm (ft-lb/in)	14 (2.6)	20 (3.7)	28 (5.2)	26 (4.8)	41 (7.5)	45 (8.4)	22 (4.0)	24 (4.4)	26 (4.8)	14 (2.6)	20 (3.7)	23 (4.3)	17 (3.2)	12 (2.2)
		1/4" kg-cm/cm (ft-lb/in)	14 (2.6)	18 (3.3)	25 (4.6)	23 (4.2)	36 (6.6)	40 (7.4)	18 (3.3)	20 (3.7)	22 (4.0)	12 (2.2)	15 (2.8)	20 (3.7)	14 (2.6)	11 (2.0)
軟化點 Vicat Softening Temp	D-1525	℃(°F)	105 (221)	105 (221)	104 (219)	105 (221)	103 (217)	105 (221)	90 (194)	92 (197)	95 (203)	97 (208)	101 (214)	115 (239)	125 (257)	129 (264)
熱變形溫度 H.D.T	D-648 (annealed) (unanealed)	℃(°F)	99(210) 88(190)	99(210) 88(190)	98(208) 87(189)	99(210) 88(190)	97(206) 86(187)	98(208) 88(190)	83(181) 73(165)	85(185) 76(179)	86(187) 79(174)	92(198) 79(174)	96(205) 81(178)	107(225) 97(206)	115(239) 105(221)	120(248) 109(228)
比重 Specific Gravity	D-792	23/23℃	1.06	1.05	1.04	1.04	1.03	1.03	1.19	1.17	1.16	1.19	1.16	1.03	1.06	1.07
流動係數 Melt Flow Index	D-1238	200℃x5kg g/10min(Cond.G)	1.9	1.8	1.2	1.8	1.2	0.5	5.2	4.8	4.2	3.3	2.8	–	–	–
	ISO-1133*	220℃x5kg g/10min	20	22	12	19	13	5	60	48	42	33	28	6.7	6.0	5.0
燃燒率 Flammability		File No. E56070 UL & C-UL	1/16" HB	1/16" HB	1/16" HB	1/16" HB	1/16" HB	1/16" HB	1/16" V-O 1/10"5VA	1/12"V-O 1/10"5VA	1/10"V-O 1/16" V-2 1/8"5VA	1/16"V-O 1/10"5VA	1/10"V-O 1/8"5VA	1/16" HB	1/16" HB	1/16" HB
產品特性			高光澤性 高剛性	高剛性 高光澤性	一般射出成型用	電鍍級	超高強度 射出成型用	超高衝擊強度 押管用	難燃性 耐光性	難燃性 耐光性	難燃性 耐光性 耐熱性	難燃性 耐光性 耐熱性	難燃性 耐光性 耐熱性	耐熱性	超耐熱性	超高耐熱
Product Description			High Gloss High Rigid	High Gloss Medium	Medium Impact	Electro-Plating	High Impact	Super pact	F.R High Flow	F.R High Flow	F.R Medium Impact	F.R Weather Resistant	F.R Weather Resistant	High Heat High Impact	Super Hifh Heat	Super Hifh Heat

http:// www.smartant.com TEL: +886 (0)3 583-6000 FAX: +886 (0)3 583-7000 E-mail: service@smartant.com

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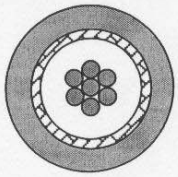
SAA05-220420

Material Approval - Cable (1/2)

SPECIFICATION

STYLE	200℃ 30V COAXIAL	DOCUMENT NO : A30178B001	
SIZE	RG-178B/U	ESTABLISHED DATE: 2000/06/29	
STANDARD : MIL-C-17			
Conductor	Size	AWG	30
	Material	----	Silver-Coated Copper Clad Steel
	Conductors No.	----	7
	Conductors Size	mm	0.102
	O.D.	mm	0.30
Insulation	Average Thickness	mm	0.28
	Diameter	mm	0.86
	Material	----	FEP
	Color	----	Clear
Braid	Material	----	Silver-Coated Copper
	Construction	mm	16 / 3 / 0.10
	Coverage	%	95
Jacket	Average Thickness	mm	0.25
	Diameter	mm	1.80 ±0.05
	Material	----	FEP
	Color	----	Brown
Marking	M17/93-RG178B/U WONDERFUL		
Drawing			

AK001/210X297/1.0 PAGE : 1
EDITION : 1.0 REVISED DATE :
MAKER : CONFIRM : APPROVAL :

WONDERFUL WIRE CABLE CO., LTD

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SAA05-220420

Material Approval - Cable (2/2)

SPECIFICATION

Electrical & Physical Properties			
Item			RG-178B/U
Rating Temp Voltage			200℃ 30V
Conductor Resistance			838.0 OHM/KM/20℃ MAX.
Insulation Resistance			100 MEGA OHM/KM MIN.
Dielectric Strength			AC 1.0 KV/Minute
Spark Test			0.5 KV
Insulation	Unaged	Tensile Strength	2500 PSI MIN.(1.76 Kg / ㎟)
		Elongation	200% MIN.
	Aged	Tensile Strength	**UNAGED MIN.75%(168HRS×232℃)**
		Elongation	**UNAGED MIN.75%(168HRS×232℃)**
Jacket	Unaged	Tensile Strength	2500 PSI MIN.(1.76 Kg / ㎟)
		Elongation	200% MIN.
	Aged	Tensile Strength	**UNAGED MIN.75%(168HRS×232℃)**
		Elongation	**UNAGED MIN.75%(168HRS×232℃)**
Nom. Impedance			50 Ohms
VSWR			MAX. 1.3 at 0.4G~3GHz
Nom. Vel. of Prop.			69.5%
Flame Test			VW-1 OK

Attenuation (dB/100m)	50MHz	100MHz	400MHz	900MHz	1.8GHz	3GHz
	34.4	45.9	91.8	139.4	207.5	308.2

AK001/210X297/1.0 PAGE : 2
EDITION : 1.0 REVISED DATE :
MAKER : CONFIRM : APPROVAL :

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SAA05-220420

Material Approval - PCB

I NAN YA PLASTICS CORPORATION
COPPER CLAD LAMINATE
QUALITY TEST REPORT

2, ng-Yang Ind. Park,
Hsin-Kang Hsiang,
Jiayih, Taiwan
TEL:(05)3772111 FAX:(05)3771640

CUSTOMER: 文翔公司
ORDER NO: HCAFAS11
LOT NO: 4927243D
DATE:2004/10/18
PALLET NO:

MATERIAL SPEC.: NP-140TL H/H 0.77mm 1240mm x 0930mm WLCFHG (OVERALL THICKNESS)
IPC DESIGNATION: L21 0300 HH/HH B/A 48.8" x 36.6" (f x g)
REQUIREMENT: IPC-4101A
SPECIFICATION SHEET: IPC-4101A / 21

NAN YA PLASTICS
COPPER CLAD LAMINATE
QUALITY ASSURANCE

CHARACTERISTICS	UNIT	CONDITIONING	SPECIFICATION	RESULTS
VISUALS(SUB-/SURFACE)	-	IPC-4101A	A	OK
METAL THICKNESS	μm	IPC-4101A	Q:8.1~9.9 T:10.8~13.2 H:15.5~18.9 1:30.9~37.7 R:46.4~56.7 2:61.4~75.5 P:77.2~94.4 3:92.7~113.3 4:123.3~150.7	17.4
DIELECTRIC CONSTANT(1MHZ)		C 24/23/50	<5.4	4.22
SURFACE RESISTANCE	MΩ	C 96/35/90	<0.50mm 10^4↑ ≧0.50mm -----	4.5E7
SURFACE RESISTIVITY	MΩ	E 24/125	10^3↑	1.8E5
VOLUME RESISTANCE	MΩ-cm	C 96/35/90	<0.50mm 10^6↑ ≧0.50mm -----	6.5E8
VOLUME RESISIVITY	MΩcm	E 24/125	10^3↑	6.8E5
DISSIPATION FACTOR(1MHZ)		C 24/23/50	0.035↓ (CFRD、CFMD:0.020↓)	.018
ARC-RESISTANCE	sec	D48/50+D1/2 /23	60↑ (CFR5、CFM5:90↑)	121
FLEXURAL STRENGTH	N/mm²	LENGTHWISE A	<0.50mm ----- ≧0.50mm 414.27↑	560
FLEXURAL STRENGTH	N/mm²	CROSSWISE A	<0.50mm ----- ≧0.50mm 345.28↑	424
THICKNESS	m/m	A	≦1.2mm CLASS C/M >1.2mm CLASS B/L	OK
THERMAL STRESS		288℃ x 10sec	No blister delamination	OK
WARP AND TWIST	%		SINGLE DOUBLE	.296
		0.5-0.78 mm A	2.0↓ 1.5↓	
		>0.79 mm A	1.5↓ 1.0↓	
PRESSURE VESSEL		D25/119.6+des (260℃X 15sec)	IPC-TM-650	OK
MOISTURE ABSORPTION	%	E1/105+des+D24/23	<0.50 mm ≧0.50 mm 0.80%↓ 0.35%↓	.167
PEEL STRENGTH	lb/in	AFTER THERMAL STRESS	Qoz:5.0↑ Toz:5.0↑ Hoz:6.0↑ 1oz:8.0↑ Roz:10.0↑ 2oz:11.0↑ Poz:11.5↑ 3oz↑:12.0↑	8.97
TG GLASS TRANSITION TEMP	℃	A	140±5	140.9
FLAMMABILITY	sec	C 24/23/50	94-V0	OK
		E 24/125	94-V0	
DIELECTRIC BREAKDOWN	KV		40↑	60

THIS IS TO CERTIFY THAT THE MATERIAL BEING FURNISHED TO YOU MEETS THE IPC-4101A.
THE RESULTS OF THIS QUALITY TEST REPORT IS PASS.

APPROVED BY : N. C. Cheng. 合格

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寰波科技股份有限公司

SmartAnt Telecom Co.,Ltd

Environment-Related Substances Report

Product Description: Antenna

SmartAnt P/N : SAA05-220420

Customer P/N:

2006/9/4

ENVIRONMENT-RELATED SUBSTANCES TO BE CONTROLLED-SAA05-220420

Item	Components		Test Item(Cr6+,Hg,Pb,PBBs,PBBEs<1000ppm,Cd<100ppm)							Pass/ Fail
			Cr6+	Cd	Hg	Pb	PBBs	PBBEs	Report No.	
1	Antenna Components	PCB	N.D	N.D	N.D	N.D	N.D	N.D	CE/2004/A1528	Pass
2		RG178 CABLE	N.D	N.D	N.D	N.D	N.D	N.D	CE/2006/10629	Pass
3		Joint	N.D	N.D	N.D	N.D	N.D	N.D	KA/2005/40050	Pass
4		Connector	Brass	N.D	34.9	N.D	27001.4	X	X	CE/2006/63956	Pass
			Phos.Bronze	N.D	N.D	N.D	N.D	X	X	CE/2004/C1498	Pass
			Au Plating	N.D	N.D	N.D	N.D	X	X	CE/2006/63959	Pass
			HD.PE	N.D	N.D	N.D	N.D	N.D	N.D	CE/2005/83039	Pass
			NBR	N.D	N.D	N.D	N.D	N.D	N.D	CE/2004/53035	Pass
			Delrin	N.D	N.D	N.D	N.D	N.D	N.D	CE/2006/41802,CE/2006/47581	Pass
5		Radome	N.D	N.D	N.D	N.D	N.D	N.D	KE/2005/41696	Pass
6	Packing	PE Bag	N.D	N.D	N.D	N.D	N.D	N.D	CE/2004/B4117A	Pass
7		Carton	表面紙板	N.D	N.D	N.D	11.3	X	X	CE/2005/92596A	Pass
			瓦稜芯紙	N.D	N.D	N.D	21.3	X	X	CE/2005/92597A	Pass
			INK	N.D	N.D	N.D	N.D	N.D	N.D	CE/2006/14801A	Pass
			RESIN	N.D	N.D	N.D	N.D	N.D	N.D	KE/2006/20995	Pass

Report No.	M47ET060805
Specifications	ETSI EN 301 893 V.1.3.1 (2005-08)
Applicant	Moxa Technologies Co., Ltd.
Applicant address	Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C.
Items tested Model No. EUT Condition	RISC-based Ready-to-Run Wireless Embedded Computer ThinkCore W341-LX ☒Engineering sample; ☐Pre-production; ☐Final production (Sample # M470805)
Results	**Compliance** (As detailed within this report)
Date	11/29/2006 (month / day / year) (Sample received) 04/02/2007 ~ 04/26/2007 (Test)
Prepared by	Project Engineer (Jack Tsai)
Authorized by	General Manager (Frank Tsai)
Issue date	*May 24, 2007* (month / day / year)
Modifications	**None**
Tested by	Training Research Co., Ltd.
Office at	No. 255, Nan Yang Street, Shijr City, Taipei Hsien 221, Taiwan
Laboratory at	1F, No. 255, Nan Yang Street, Shijr City, Taipei Hsien 221, Taiwan
Open site at	No. 15, Lane 530, Balian Rd., Sec. 1, Shijr City, Taipei Hsien 221, Taiwan

Conditions of issue:

This test report shall not be reproduced except in full, without written approval of TRC. And the test result contained within this report only relate to the sample submitted for testing.

★ ***Aut. No. ELA 131***

We here by verify that:

The test data, data evaluation, test procedures and equipment configurations shown in this report were made mainly in accordance with the procedures given in ETSI EN 301 893 (V.1.3.1) as a reference. All test were conducted by ***Training Research Co., Ltd.***, 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. Also, we attest to the accuracy of each.

We further submit that the energy emitted by the sample EUT tested as described in the report is **in compliance with** the technical requirements set second edition in the European Telecommunication Standard ETSI EN 301 893 (V.1.3.1).

Reservation:

The test results herein refer only to the tested sample. Training Research Co., Ltd. is not responsible for any generalizations or conclusions draw from these test results and concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report.

Test by :

Training Research Co., Ltd.

TEL: 886-2-26935155 FAX: 886-2-26934440

No. 255, Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C.

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I. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of Applicant in support of a wireless LAN measurement in accordance with ETSI EN 301 893 V1.3.1 (August, 2005) of the European Telecommunication Standard.

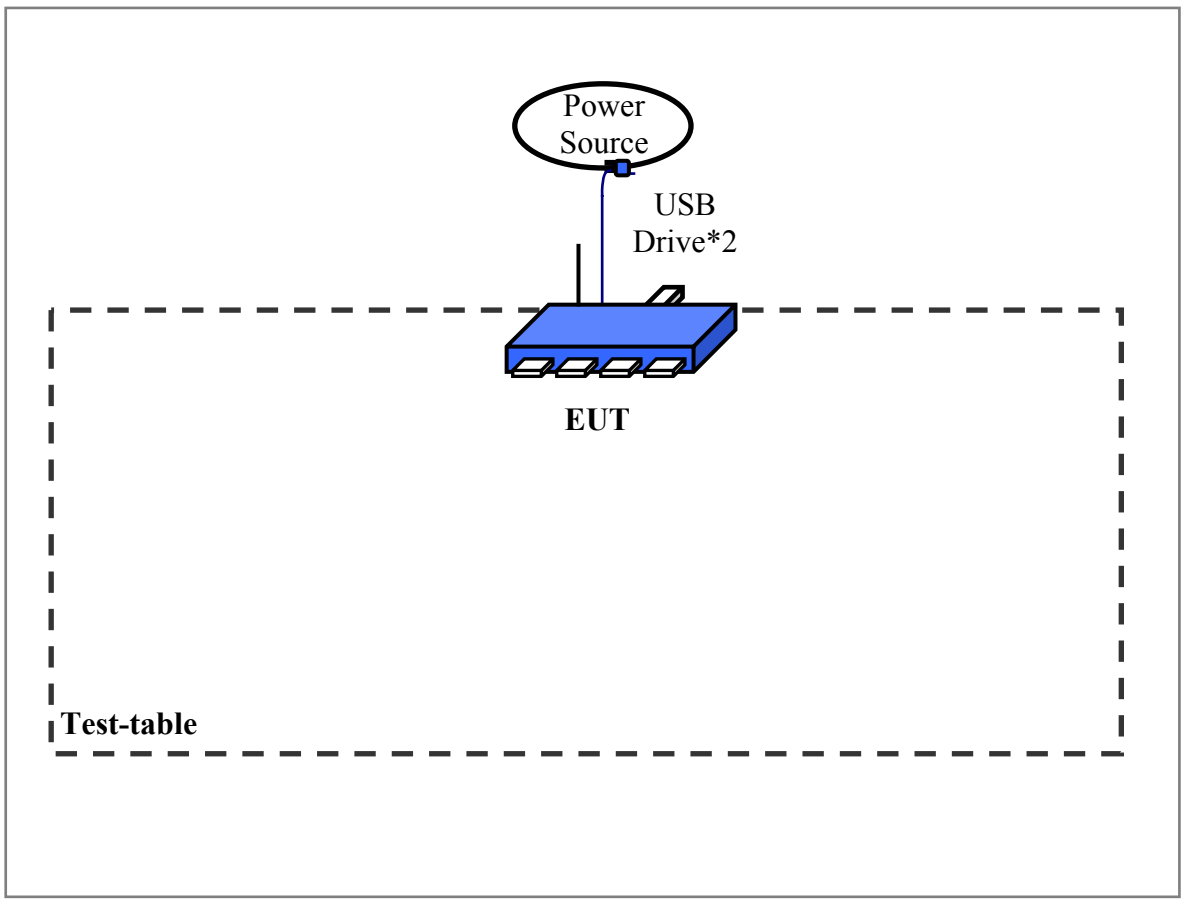
1.2 Description of EUT

Product Name	**:**	RISC-based Ready-to-Run Wireless Embedded Computer
Model No.	**:**	ThinkCore W341-LX
Frequency Range	**:**	5.150GHz ~ 5.250GHz
Operating Frequency	**:**	5.180GHz ~ 5.240GHz
RF output power		15.104 dBm
Channel Spacing	**:**	20MHz
Support Channel	**:**	4 Channels
Modulation Skill	**:**	DBPSK, DQPSK, CCK, OFDM
Power Type	**:**	Powered by the switching adapter, Manufacture: BALANCE ELECTRONICS CO., LTD. Model: GPSA-1200125 I/P: 100 ~ 240VAC ~ 50/60Hz 0.5A O/P: 12VDC 1.2A. Primary: 182cm length, non-shielded, without ferrite core Secondary: 186cm length, non-shielded, without ferrite core

1.3 Test Method

1. Using software provided by the manufacturer to control the EUT. The test is performed under the specific conditions.
2. Set different channel and data rate being tested, and then making EUT to the following modes:
   a) The mode of continuous transmission.
   b) The receive mode.
   c) The standby mode.

1.4 Configuration of System Under Test



The tests below are carried with the EUT transmitter set at high power in TDD mode. The EUT is forced to select of output power level and channel number by computer.

1.5 List of Measurements

Clause	Parameter To Be Measured	Pass	Fail	N. A.
	Transmitter Parameter			
4.2	**Carrier frequencies**	X		
4.3.1	**RF output power**	X		
4.3.2	**Transmit Power Control (TPC)**			X
4.3.3	**power density**	X		
4.4.1	**Transmitter unwanted emission outside the 5 GHz RLAN bands**	X		
4.4.2	**Transmitter unwanted emission within 5 GHz RLAN bands**	X		
4.6	**Dynamic Frequency Selection (DFS)**			X
	Receiver Parameter			
4. 5	**Spurious Emissions**	X		

Note:

Clause 4.3.2 TPC – TPC is not required in the band 5150 MHz to 5250 MHz.

Clause 4.6 DFS – Radar detection is not required in the frequency range 5150 MHz to 5250 MHz.

1.6 Verify the Frequency and Channel

CH	1	2	3	4
frequency	5180	5200	5220	5240

Note:

(1) This is for sure that all frequencies are in 5.150GHz ~ 5.250GHz.

(2) After test, the EUT (IEEE 802.11a) operating frequencies are in 5.180GHz ~ 5.240GHz. So all the item as followed in testing report are need to test these three frequencies:
channel lowest and channel highest except carrier frequencies apply to each channel.

(3) Restricted to indoor use.

1.7 Test Procedure

All measurements performed in this report were performed mainly according to the techniques described in ETSI EN 301893 (August, 2005) and the pre-setup was written on 5 test method, the detail setup was written on each test item.

1.8 Location of the Test Site

The radiated emissions measurements required by the rules were performed on the **three-meter**, **Anechoic Chamber (Registration Number: 93906)** maintained by *Training Research Co., Ltd.* 1F., No. 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. Complete description and measurement data have been placed on file with the commission. The conducted power line emissions tests and other test items were performed in a anechoic chamber also located at *Training Research Co., Ltd.*

No. 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. *Training Research Co., Ltd.* is listed by the FCC as a facility available to do measurement work for others on a contract basis.

1.9 General Test Condition

The test condition shall be as follows: (See Clause 5.1)

The NORMAL temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:

-temperature: 0℃ to +40℃;

-relative humidity: 20% to 85%.

The normal test voltage for equipment to be connected to the main shall be the nominal mains voltage.

For purpose of this ETS, the normal voltage shall be the declared voltage or any of the declared voltages for which the equipment was designed.

The frequency of the test power source corresponding to the AC mains shall be between 49Hz and 51Hz.

The nominal test voltage shall be as declared by the equipment manufacturer for operation from other power sources or types of battery (primary or secondary). This shall be recorded in the test report.

For tests at EXTREME temperatures, measurements shall be as declared by the equipment manufacturer in accordance with the procedures specified in clause 5.1.1, at the upper and lower temperatures of the range as follows:

temperature: -10℃ to +60℃;

The carrier frequencies as in clause 4.2.2 and the e.i.r.p. Limit in clause 4.3.2 shall not be exceeded.

Tests at extreme power source voltages specified below are not required when the equipment under test is designed for operation as part of and powered by another system or piece of equipment. Where this is the case, the limit values of the host system or host equipment shall apply. The appropriate limit values shall be declared by the manufacturer and recorded in the test report.

The EXTREME TEST VOLTAGE for equipment to be connected to an AC mains source shall be the nominal mains voltage ±10%.

For equipment using other power sources, or capable of being operated from a variety of power sources (primary or secondary), the extreme test voltages shall be those declared by the manufacturer; these shall be recorded in the test report. Before measurements are made the equipment shall have reached thermal balance in the test chamber.

II. Section 4.2: Carrier frequencies

2.1 Limit

ETSI EN 301 893 clause 4.2.2

The actual carrier center frequency for any given channel shall be maintained within the range of $f_c \pm 20$ ppm. of the designated center frequency for that channel.

2.2 Test Condition

These measurements shall be performed under both normal and extreme test conditions (see clause 5.1.1).

2.3 Test Procedures

Please refer to item 5.3.2.2 of the standard.

2.4 Deviation form test standard

No deviation.

2.5 Test Results

Frequency	TEST CONDITION				Max. Frequency Deviation (ppm.)
	Temperature	Voltage			
		207Vac (Min)	230Vac (Norm)	253Vac (Max)	
5180 MHz	**-10 °C**	5179.9564	5179.9572	5179.9578	+19.07 / -8.42
	25 °C	5179.9902	5179.9916	5179.9924	
	60 °C	5180.0962	5180.0981	5180.0988	
5200 MHz	**-10 °C**	5199.9560	5199.9568	5199.9570	+19.19 / -8.46
	25 °C	5199.9788	5199.9876	5199.9880	
	60 °C	5200.0990	5200.0996	5200.0998	
5220 MHz	**-10 °C**	5219.9524	5219.9528	5219.9532	+19.35 / -9.12
	25 °C	5219.9864	5219.9888	5219.9890	
	60 °C	5220.0998	5220.1004	5220.1010	
5240 MHz	**-10 °C**	5239.9542	5239.9548	5239.9554	+19.43 / -8.74
	25 °C	5239.9856	5239.9868	5239.9874	
	60 °C	5240.1012	5240.1016	5240.1018	

Limit	±20 ppm.
Uncertainty	± 2141.21 Hz

NOTE: This test method requires that the UUT can be operated in an unmodulated mode.

III.Section 4.3: RF output, Transmit Power Control (TPC) and power density

3.1 RF output power at the highest power level

(1) Limit: ETSI EN 301 893 clause 4.3.2.1

Frequency range	Mean EIRP limit
5150 MHz to 5350 MHz	23 dBm
5470 MHz to 5725 MHz	30 dBm

Note: For devices without TPC, the limits shall be reduced by 3 dB, except when operating in the band 5150MHz to 5250MHz.

(2) Test Condition:

Please refer to item 5.3.3.1 of the standard.

(3) Test Procedures

Please refer to item 5.3.3.2.1.1 of the standard.

(4)Deviation form test standard

No deviation.

(5) Test Result:

Power level at which the measurement has been performed 32.39 mW

Frequency	Temperature	Voltage (V)	TRANSMITTER POWER		
			Tx Peak (dBm)	Tx Ave. (dBm)	Cable Loss (dB)
5180 MHz	25	230	9.823	1.748	9
	-10	207	11.529	4.101	
		253	11.534	4.104	
	60	207	7.252	-1.374	
		253	7.259	-1.370	
5240 MHz	25	230	9.686	1.581	9
	-10	207	11.560	4.049	
		253	11.566	4.057	
	60	207	7.187	-1.524	
		253	7.190	-1.519	
Limit			Pk: 23 dBm, Av: 20dBm		
Uncertainty			± 0.56dB		

NOTE:

(1) The E.U.T is a stand-alone radio device (see the clause 5.3.2.2). The powered by the adaptor. So, the AC power is used as the extreme voltage source. (See clause 5.3.4.2)

(2) The value of table is worst case during test condition, includes different combinations of transmitter rate antenna polarity and temperature

(3) Duty cycle (X): 100%.

Average power = Tx Ave. + Cable Loss + Antenna Gain (2.00dBi) = 15.104 dBm,

E.I.R.P. = Average power +10 log (1/X)

= 15.104 dBm + 0 dB

= 15.104 dBm

3.2 RF output power at the lowest power level of the TPC range

(1) Limit: ETSI EN 301 893 clause 4.3.2.2

ıency range	Mean EIRP limit
5150 MHz to 5350 MHz	17 dBm
5470 MHz to 5725 MHz	24 dBm

Note:

a. For devices using TPC, the RF output power during a transmission burst when configured to operate at the lowest stated power level of TPC range shall not exceed the levels given table.

b. The limits do not apply for devices without TPC or when operating in the band 5 150 MHz to 5250 MHz..

(2) Test Condition:

Please refer to item 5.3.3.1 of the standard.

(3) Test Procedures

Please refer to item 5.3.3.2.1.2 of the standard.

(4)Deviation form test standard

No deviation.

Test Result:

Not applied. It is operating in the band 5 150 MHz to 5250 MHz.

3.3 Power density

(1) Limit: ETSI EN 301 893 clause 4.3.2.1

Frequency range	Mean EIRP density limit
5150 MHz to 5350 MHz	10 dBm
5470 MHz to 5725 MHz	17 dBm

Note: For devices without TPC, the limits shall be reduced by 3 dB, except when operating in the band 5150MHz to 5250MHz.

(2) Test Condition:

Please refer to item 5.3.3.1 of the standard.

(3) Test Procedures

Please refer to item 5.3.3.2.1.3 and 5.3.3.2.2 of the standard.

(4)Deviation form test standard

No deviation.

Test Result:

Channel	Frequency (MHz)	Reading valuer (dBm)	CF (dB)	Ant. Gain(dB)	Duty cycle(dB)	Actually Value (dBm)	Limit (dBm)	Margin (dB)
CH 01	5180	-2.85	10.3	2.00	0	9.45	10.00	-0.55
CH 04	5140	-3.41	10.3	2.00	0	8.89	10.00	-1.11
Uncertainty	± 1.50dB							

Note:

Duty cycle (X): 100%.

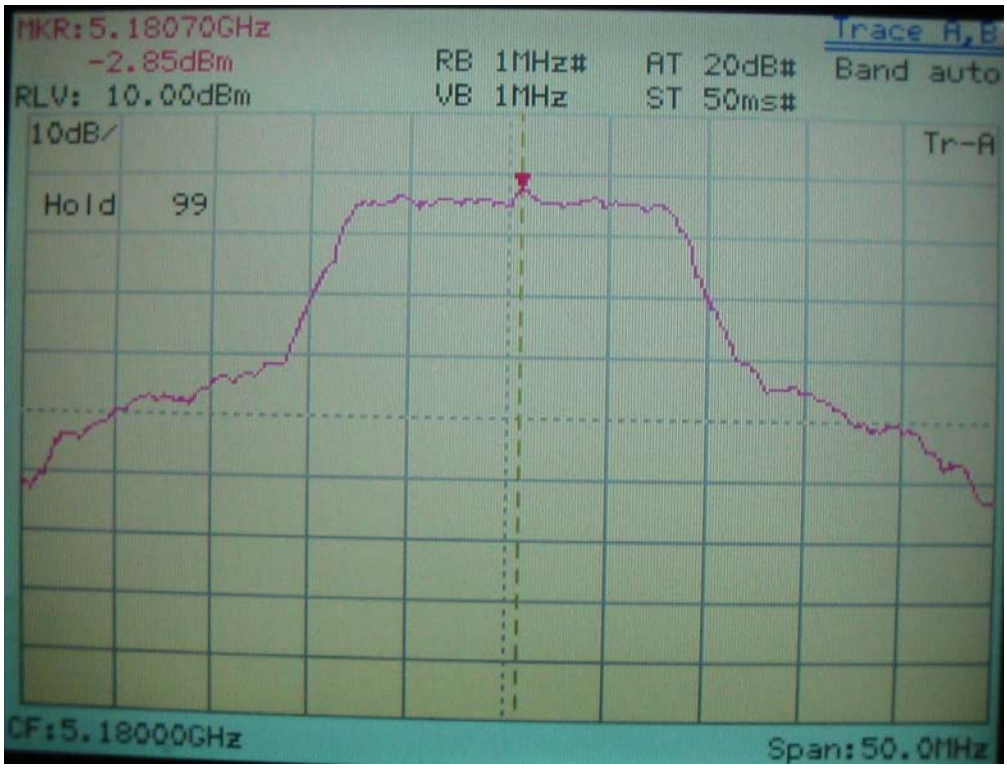
Power density (eirp)= Reading value. + Cable Loss + Antenna Gain (2.00dBi) +10 log (1/X),

= 9.45 dBm +10 log (1/X)

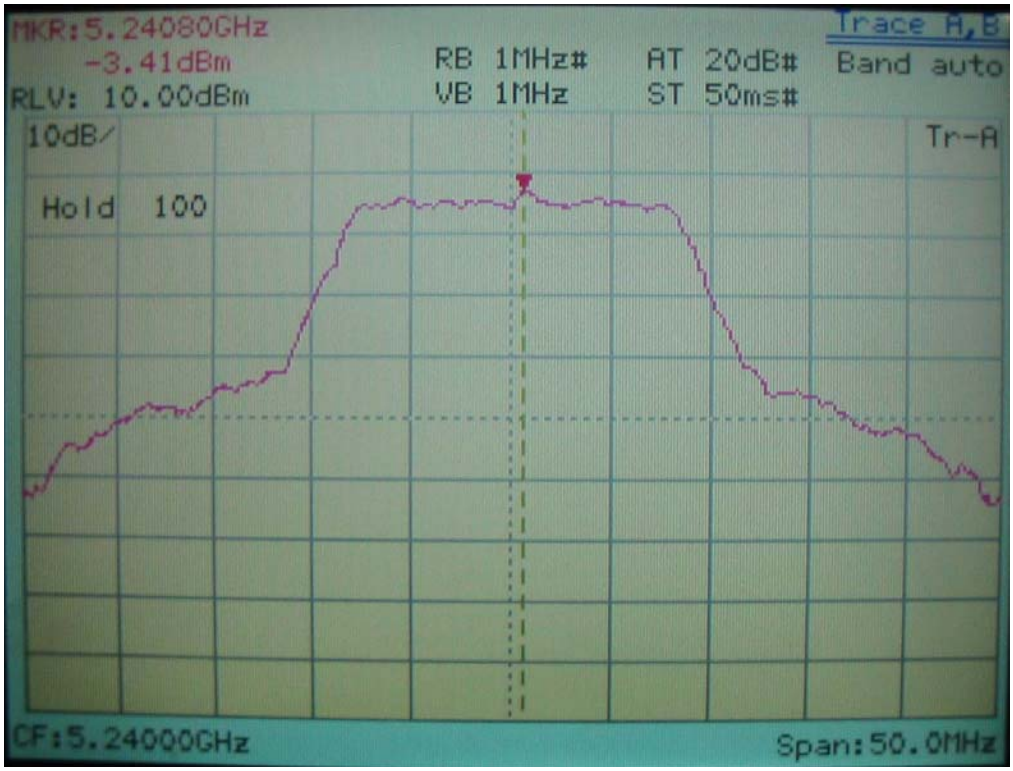
= 9.45 dBm + 0 dB

= 9.45 dBm

5180MHz



5240MHz



IV. Section4.4: Transmitter unwanted emissions

4.1 Test Result of Transmitter unwanted emission outside the 5 GHz RLAN bands

5180MHz (30MHz to 1GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
192.47	H	-62.84	-54.00	-8.84	54
250.07	H	-60.73	-36.00	-24.73	54
481.05	H	-67.62	-54.00	-13.62	54
672.02	H	-61.66	-54.00	-7.66	54
767.81	H	-61.07	-54.00	-7.07	54
864.20	H	-58.75	-36.00	-22.75	54
153.68	V	-57.20	-36.00	-21.20	54
192.47	V	-64.37	-54.00	-10.37	54
260.37	V	-61.30	-36.00	-25.30	54
481.05	V	-64.99	-54.00	-10.99	54
767.81	V	-62.17	-54.00	-8.17	54
864.20	V	-58.04	-36.00	-22.04	54

Note:

(1) A. P. means antenna polarization, horizontal and vertical.
Amplitude means the fundamental emission measured
C F. means Correct Factor, Rate means transmitter rate
Corrected Factor (C. F.) = Cable Loss + Antenna Factor – Amplified Gain
LEVEL = Amplitude + Corrected Factor

(2) The margin is minus that means under limit.

(3) The value of table is the worst case during test condition. This is including different combinations of transmitter rate antenna polarity and temperature.

(4) The level of confidence of 95% , the uncertainty of measurement of radiated emission is +2.85dB / -2.77dB

5240MHz (30MHz to 1GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
192.47	H	-61.91	-54.00	-7.91	54
250.67	H	-61.05	-36.00	-25.05	54
480.44	H	-67.59	-54.00	-13.59	54
672.02	H	-62.20	-54.00	-8.20	54
767.81	H	-60.15	-54.00	-6.15	54
864.20	H	-57.78	-36.00	-21.78	54
154.28	V	-57.52	-36.00	-21.52	54
192.47	V	-63.42	-54.00	-9.42	54
390.72	V	-58.50	-36.00	-22.50	54
480.44	V	-65.67	-54.00	-11.67	54
672.02	V	-63.96	-54.00	-9.96	54
864.20	V	-58.09	-36.00	-22.09	54

5180MHz (1GHz to 26.50GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
5616.67	H	-49.12	-30.00	-19.12	54
7241.17	H	-46.84	-30.00	-16.84	54
7950.67	H	-47.11	-30.00	-17.11	54
10360.08	H	-45.12	-30.00	-15.12	54
15541.83	H	-47.98	-30.00	-17.98	54
5304.17	V	-45.08	-30.00	-15.08	54
7034.00	V	-48.54	-30.00	-18.54	54
7646.33	V	-47.94	-30.00	-17.94	54
10360.08	V	-45.45	-30.00	-15.45	54
15541.83	V	-48.31	-30.00	-18.31	54

5240MHz (1GHz to 26.50GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
5637.50	H	-47.77	-30.00	-17.77	54
6425.33	H	-49.09	-30.00	-19.09	54
6876.33	H	-48.53	-30.00	-18.53	54
7609.67	H	-48.64	-30.00	-18.64	54
10482.58	H	-46.00	-30.00	-16.00	54
5579.17	V	-47.82	-30.00	-17.82	54
6511.50	V	-48.73	-30.00	-18.73	54
7288.83	V	-47.88	-30.00	-17.88	54
10482.58	V	-46.83	-30.00	-16.83	54
15721.50	V	-48.07	-30.00	-18.07	54

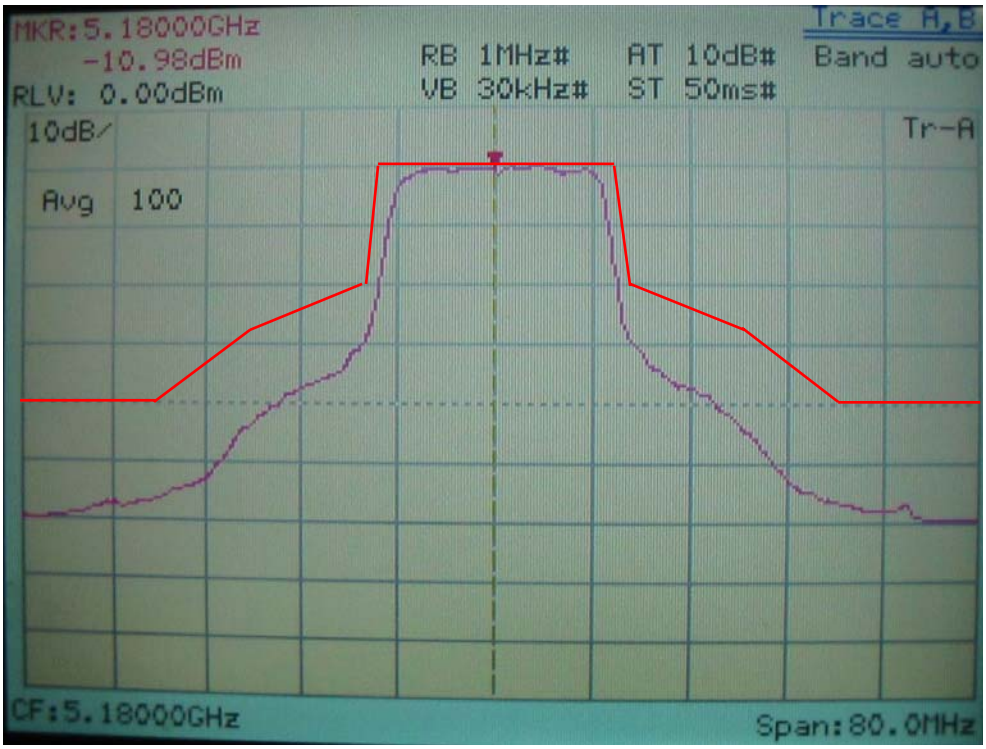
4.2 Test Result for Standby mode

(30MHz to 26.50GHz)

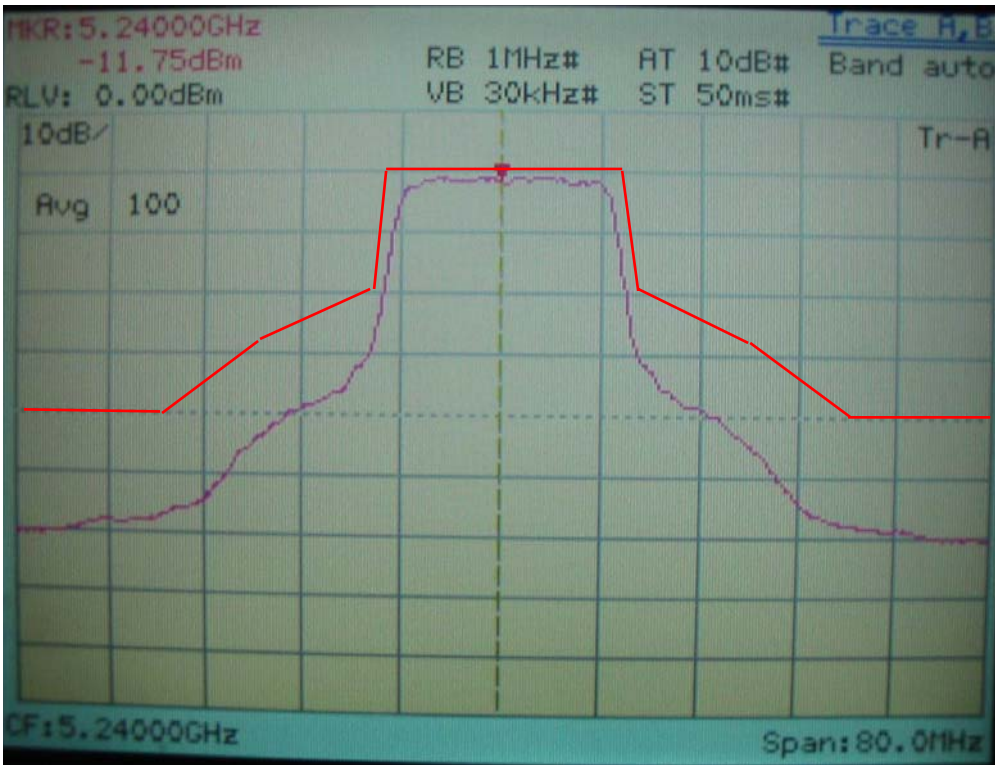
Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
240.97	H	-58.20	-57.00	-1.20	---
259.77	H	-58.76	-57.00	-1.76	---
288.26	H	-59.71	-57.00	-2.71	---
672.62	H	-59.28	-57.00	-2.28	---
767.81	H	-59.00	-57.00	-2.00	---
864.20	H	-59.93	-57.00	-2.93	---
2473.33	H	-56.81	-47.00	-9.81	---
3897.08	H	-53.27	-47.00	-6.27	---
5724.58	H	-50.60	-47.00	-3.60	---
8451.67	H	-52.06	-47.00	-5.06	---
192.47	V	-63.33	-57.00	-6.33	---
221.57	V	-61.86	-57.00	-4.86	---
288.26	V	-63.48	-57.00	-6.48	---
385.26	V	-63.60	-57.00	-6.60	---
672.62	V	-60.41	-57.00	-3.41	---
864.81	V	-58.43	-57.00	-1.43	---
2728.33	V	-57.46	-47.00	-10.46	---
4045.83	V	-52.68	-47.00	-5.68	---
6418.75	V	-52.87	-47.00	-5.87	---
10109.17	V	-50.91	-47.00	-3.91	---

4.3 Test Result of Transmitter unwanted emission within 5 GHz RLAN bands

5180MHz



5240MHz



V. Section 4.6: Dynamic Frequency Selection (DFS)

5.1 Test Result of Frequency Range for DFS

(1)Limit:

Please refer to item Annex D of the standard

(2) Test Condition:

Please refer to item 5.3.7.1 of the standard.

(3) Test Procedures

Please refer to item 5.3.7.2 of the standard.

(4) Deviation form test standard

No deviation.

Test Result:

Not applied. Radar detection is not required in the frequency range 5150 MHz to 5250 MHz

VI. Section 4.5: Spurious Emissions of Receiver

5180MHz (30MHz to 1GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
164.59	H	-63.67	-57.00	-6.67	54
192.47	H	-62.89	-57.00	-5.89	54
251.28	H	-60.29	-57.00	-3.29	54
672.62	H	-62.63	-57.00	-5.63	54
767.81	H	-59.69	-57.00	-2.69	54
864.20	H	-59.86	-57.00	-2.86	54
153.68	V	-57.95	-57.00	-0.95	54
193.08	V	-64.27	-57.00	-7.27	54
250.67	V	-60.57	-57.00	-3.57	54
384.66	V	-63.20	-57.00	-6.20	54
672.62	V	-63.30	-57.00	-6.30	54
864.20	V	-57.27	-57.00	-0.27	54

Note:

(1) A. P. means antenna polarization, horizontal and vertical.
Amplitude means the fundamental emission measured.
C F. means Correct Factor, Rate means transmitter rate
Corrected Factor (C. F.) = Cable Loss + Antenna Factor – Amplified Gain
LEVEL = Amplitude + Corrected Factor

(2) The value of table is worst case during test condition, includes different combinations of transmitter rate antenna polarity and temperature

(3) The level of confidence of 95% , the uncertainty of measurement of radiated emission is +2.85dB / -2.77dB

5240MHz (30MHz to 1GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
192.47	H	-62.47	-57.00	-5.47	54
249.46	H	-61.32	-57.00	-4.32	54
287.66	H	-64.25	-57.00	-7.25	54
672.62	H	-61.93	-57.00	-4.93	54
767.81	H	-59.49	-57.00	-2.49	54
864.20	H	-59.83	-57.00	-2.83	54
150.64	V	-58.19	-57.00	-1.19	54
259.77	V	-62.38	-57.00	-5.38	54
288.26	V	-63.50	-57.00	-6.50	54
481.05	V	-63.41	-57.00	-6.41	54
767.81	V	-62.17	-57.00	-5.17	54
864.20	V	-58.16	-57.00	-1.16	54

Channel 1 (1GHz to 26.50GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
2643.33	H	-56.10	-47.00	-9.10	54
3861.67	H	-52.14	-47.00	-5.14	54
6425.83	H	-51.71	-47.00	-4.71	54
10116.25	H	-50.44	-47.00	-3.44	54
2388.33	V	-55.88	-47.00	-8.88	54
3996.25	V	-52.01	-47.00	-5.01	54
6185.00	V	-50.32	-47.00	-3.32	54
9131.67	V	-51.38	-47.00	-4.38	54

Channel 13 (1GHz to 26.50GHz)

Frequency (MHz)	A. P. (H/V)	LEVEL (dBm)	Limit (dBm)	Margin (dB)	Rate (Mbps)
2140.42	H	-57.10	-47.00	-10.10	54
3337.50	H	-53.01	-47.00	-6.01	54
5908.75	H	-50.38	-47.00	-3.38	54
9585.00	H	-51.53	-47.00	-4.53	54
2388.33	V	-55.38	-47.00	-8.38	54
3996.25	V	-51.84	-47.00	-4.84	54
6645.42	V	-52.69	-47.00	-5.69	54
10116.25	V	-50.94	-47.00	-3.94	54

VII. Instrument and Ancillaries Equipment of List

Instrument Name	Model	Brand	Serial No.	Calibration Date Next time
EMI Receiver	8546A	HP	3520A00242	09/06/07
RF Filter Section	85460A	HP	3448A00217	09/06/07
Small Biconical Antenna	UBAA9114 & BBVU9135	SCHWARZECK	127	12/07/07
Pre-amplifier	PA1F	TRC	1FAC	05/20/07
Auto Switch Box (>30MHz)	ASB-01	TRC	9904-01	05/20/07
Coaxial Cable (Double shielded, 15 meter)	A30A30-0058-50FS-15M	JYEBAO	SMA-01	05/20/07
Coaxial Cable (1.1 meter)	A30A30-0058-50FS-1M	JYEBAO	SMA-02	05/20/07
Spectrum Analyzer	8564E	HP	3720A00840	12/11/07
Microwave Preamplifier	84125C	HP	US36433002	11/18/07
Horn Antenna	3115	EMCO	9104-3668	02/05/08
Standard Guide Horn Antenna	84125-80008	HP	18-26.5GHz	12/12/07
Standard Guide Horn Antenna	84125-80001	HP	26.5-40GHz	12/12/07
Horn Antenna	1196E (3115)	HP (EMCO)	9704-5178	02/12/08
Pre-amplifier	PA2F	TRC	2F1GZ	06/20/07
Coaxial Cable (3 miter)	A30A30-0058-50FST118	JYEBAO	MSA-05	06/20/07
Coaxial Cable (1 meter)	A30A30-0058-50FST118	JYEBAO	MSA-04	06/20/07

Report No.	M47ET060805
Specifications	ETSI EN 301 489-1 V1.5.1 (November, 2004) ETSI EN 301 489-17 V1.2.1 (April, 2002)
Applicant	Moxa Technologies Co., Ltd.
Applicant address	Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C.
Items tested Model No. EUT Condition	RISC-based Ready-to-Run Wireless Embedded Computer ThinkCore W341-LX ☒Engineering sample; ☐Pre-production; ☐Final production (Sample # M470805)
Results	**Compliance** (As detailed within this report)
Date	11/29/2006 (month / day / year) (Sample received) 03/29/2007 ~ 05/04/2007 (Test)
Prepared by	Project Engineer (Jack Tsai)
Authorized by	General Manager (Frank Tsai)
Issue date	*May 10, 2007* (month / day / year)
Modifications	**None**
Tested by	Training Research Co., Ltd.
Office at	No. 255, Nan Yang Street, Shijr City, Taipei Hsien 221, Taiwan
Laboratory at	1F, No. 255, Nan Yang Street, Shijr City, Taipei Hsien 221, Taiwan
Open site at	No. 2, Lane 530, Balian Rd., Sec. 1, Shijr City, Taipei Hsien 221, Taiwan

Conditions of issue:

This test report shall not be reproduced except in full, without written approval of TRC. And the test result contained within this report only relate to the sample submitted for testing.

★ *Aut. No. ELA 131*

Generally Statement:

The results appear in the following order:

Electromagnetic compatibility and radio spectrum matters (ERM); Electro Magnetic Compatibility (EMC) standard for radio equipment and services;

Part 1: Common Technical requirements

Part 17: Specific conditions for Wideband data and HIPERLAN equipment.

The results exhibits below only apply to particular samples tested and to the specific tests carried out, as detailed in this Test Report. The issue of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by Training Research Co., Ltd. of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of the Director, Training Research Co., Ltd. who reserves the absolute right to agree or reject all or any of the details of any item of publicity for which consent may be sought.

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Chapter 0 Emission and Susceptibility Standards

Emission Standards

Emission Standard	European Standard	International Standard
( )	EN 61000-6-3/2001	IEC 61000-6-3/1996
( )	EN 61000-6-4/2001	IEC 61000-6-4/1997
( )	EN 50081-1/1992	
( )	EN 50081-1/8.93	
( )	EN 55014/4.93	CISPR 14: 1993
( )	EN 55015/12.93	CISPR 15: 1992
( )	EN 55013/2001	CISPR 13: 2001
(X)	EN 55022/98 +A1/2000 +A2/2003	CISPR 22: 2002
(X)	EN 61000-3-2/2000	IEC 61000-3-2: 2000
(X)	EN 61000-3-3/1995 +A1/2001	IEC 61000-3-3: 1994 +A1/2001

Susceptibility Standards

Susceptibility Standard	European Standard	International Standard
( )	EN 61000-6-1/2001	IEC 61000-6-1/1997
( )	EN 61000-6-2/2001	IEC 61000-6-2/1999
( )	EN 50082-1/1997	
( )	EN 50082-2/1994	
( )	EN 55024/1998 +A1/2001+A2/2003	CISPR 24/1997
( )	EN 55020/2002	CISPR 20/2002
(X)	EN 61000-4-2:2001	IEC 61000-4-2:2001
(X)	EN 61000-4-3:2002 +A1/2002	IEC 61000-4-3:2002 +A1/2002
(X)	EN 61000-4-4:1995 +A1/2000 +A2/2001	IEC 61000-4-4:1995 +A1/2000+A2/2001
(X)	EN 61000-4-5:2001	IEC 61000-4-5:2001
(X)	EN 61000-4-6:2003	IEC 61000-4-6:2003
( )	EN 61000-4-8:2001	IEC 61000-4-8:2001
(X)	EN 61000-4-11:2001	IEC 61000-4-11:2001

Chapter 1 Introduction

Description of EUT

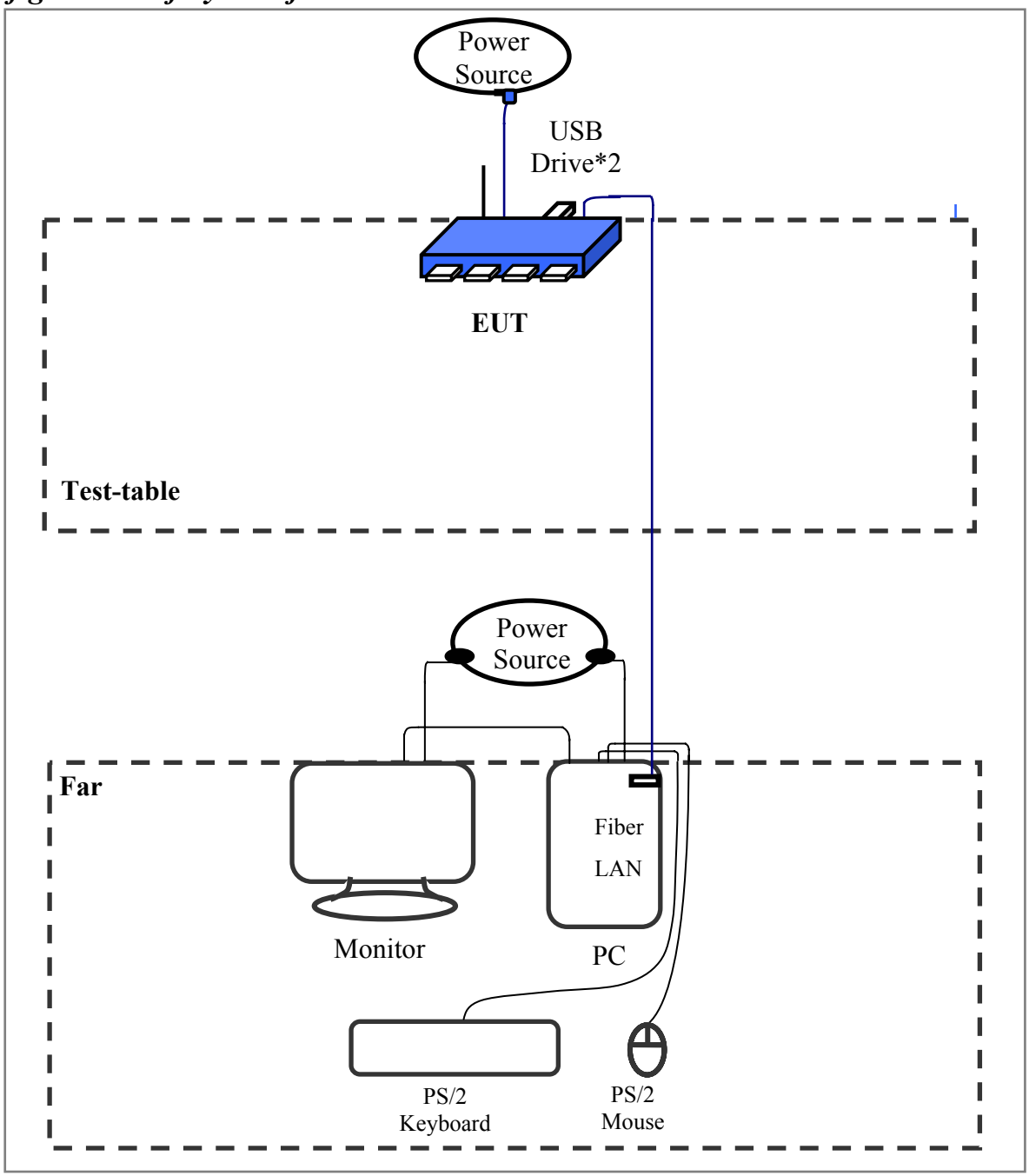
Product Name	**:**	RISC-based Ready-to-Run Wireless Embedded Computer
Model No.	**:**	ThinkCore W341-LX
Frequency Range	**:**	2.400GHz ~ 2.4835GHz/5.150GHz ~ 5.250GHz
Operating Frequency	**:**	2.412GHz ~ 2.472GHz/5.180GHz ~ 5.240GHz
Support Channel	**:**	13 Channels/4 Channels
Channel Spacing	**:**	5MHz/20MHz
Modulation Skill	**:**	DBPSK, DQPSK, CCK, OFDM
Power Type	**:**	Powered by the switching adapter, Manufacture: BALANCE ELECTRONICS CO., LTD. Model: GPSA-1200125 I/P: 100 ~ 240VAC ~ 50/60Hz 0.5A O/P: 12VDC 1.2A. Primary: 182cm length, non-shielded, without ferrite core Secondary: 186cm length, non-shielded, without ferrite core
Data Cable	**:**	Eithernet Cable x 1, 10m length, non-shielded, without ferrite core

Remark: Restricted to telecommunication centres use.

Test Method

1. The DC-In connected to AC mains supply by switching adapter.
2. The two USB ports connected with USB flash drive.
3. The Relay Output port connected with terminator.
4. The LAN port of EUT connected to far LAN card.
5. The four RS-232/422/485 ports connected with terminators.
6. The notebook PC and test fixture is connected by USB transfer to RS-232 cable, and then test fixture connected with EUT setting test mode.
7. Using the PC and software provided by the manufacturer to control EUT, the test is performed under the specific conditions.
8. Then making EUT to the following mode.
   (a) EMI testing: making EUT to linking mode with support equipments
   (b) EMS testing: same as above

Configuration of System for Conducted and Radiated



Connections of equipment

PC:

* VGA Port ..... a monitor
* PS/2-key Port ..... a PS/2 keyboard
* PS/2-mouse Port ..... a PS/2 mouse
* Fiber Port ..... **EUT**

List of Support Equipment

In order to construct the minimum testing, following equipment were used as the support units.

PC	**:**	**HP**
Model No.	:	Pavilion t1000
Serial No.	:	TWL3320051
FCC ID	:	N/A, DoC (Declaration of Confirmation) Approved
BSMI	:	R33001
Power type	:	100 ~ 127VAC/200 ~ 240VAC, 6A/3A, 50 ~ 60Hz, Switching
Power cord	:	Non-shielded, 1.80m length, Plastic hood, No ferrite core

Monitor	**:**	**HP Flat Panel Monitor**
Model No.	:	PE1234
Serial No.	:	CNN4120K7T
FCC ID	:	DoC Approved
BSMI	:	T3A002
Power type	:	100 ~ 240 VAC / 50 ~ 60 Hz, Switching
Power cord	:	Shielded, 1.83m length, No ferrite core
Data cable	:	Shielded, 1.80m length, with two ferrite cores

Mouse	**:**	**HP**
Model No.	:	M-UR89
Serial No.	:	LZS21750238
FCC ID	:	DoC Approved
BSMI	:	3892D767
Power type	:	By PC
Power cord	:	Non-shielded, 1.88m length, No ferrite core

Keyboard	**:**	**HP**
Model No.	:	5187-0343
Serial No.	:	BE21700404
FCC ID	:	DoC Approved
BSMI	:	3892C981
Power type	:	By PC
Data cable	:	Shielded, 1.73m length, Plastic hood, No ferrite core

LAN Card	**:**	**D-Link**
Model No.	:	DFE-530TX
Serial No.	:	0050BAE32FF3, 0050BAE3158B
FCC ID	:	N/A, DoC Approved
Power type	:	Powered by PC

WLAN AP	**:**	**Planex Communication Inc.**
Model No.	:	BLW-045AG
Serial No.	:	40DDA0093
DGT ID	:	DGT093LP0296
Power type	:	Powered by AC adaptor

USB 2.0

Flash Disk	**:**	**Transcend Information, Inc.**
Model No.	:	TS128MJF2A
Serial No.	:	85047; 85133
BSMI	:	D33193
Power type	:	By EUT

Chapter 2 Emission and Immunity Requirements Overview

Emission (ETSI EN 301 489-1)

Phenomenon	Application	Equipment test requirement			Reference Subclause in the present document
		Radio and ancillary equipment for fixed use (base station equipment)	Radio and ancillary equipment for vehicular use (mobile equipment)	Radio and ancillary equipment for portable use (portable equipment)	
Radiated emission	Enclosure of ancillary equipment	Applicable for stand alone testing	Applicable for stand alone testing	Applicable for stand alone testing	8.2
Conducted emission	DC power input/output port	Applicable	Applicable	Not applicable	8.3
Conducted emission	AC mains input/output port	Applicable	Not applicable	Not applicable	8.4
Harmonic current emissions	AC mains input port	Applicable	Not applicable	Not applicable	8.5
Voltage fluctuations and flicker	AC mains input port	Applicable	Not applicable	Not applicable	8.6

Immunity (ETSI EN 301 489-1)

Phenomenon	Application	Equipment test requirement			Reference Subclause in the present document
		Radio and ancillary equipment for fixed use (base station equipment)	Radio and ancillary equipment for vehicular use (mobile equipment)	Radio and ancillary equipment for portable use (portable equipment)	
RF electromagnetic field (80MHz to 1GHz)	Enclosure	Applicable	Applicable	Applicable	9.2
Electrostatic discharge	Enclosure	Applicable	Applicable	Applicable	9.3
Fast transients common mode	Signal, telecommunication and control ports, DC and AC power ports	Applicable	Not applicable	Not applicable	9.4
RF common mode 0.15 MHz to 80MHz	Signal, telecommunication and control ports, DC and AC power ports	Applicable	Applicable	Not applicable	9.5
Transients and surges	DC power input ports	Not applicable	Applicable	Not applicable	9.6
Voltage dips and interruptions	AC mains power input ports	Applicable	Not applicable	Not applicable	9.7
Surges, line to line and line ground	AC mains power input ports, telecommunication ports	Applicable	Not applicable	Not applicable	9.8

Chapter 3 Performance Criteria

ETSI EN 301 489-17, Subclause 6.2

Table 1 Performance criteria		
Criteria	**During test**	**After test**
A	Shall operate as intended May show degradation of performance (**NOTE 1**) Shall be no loss of function Shall be no unintentional transmissions	Shall operate as intended Shall be no degradation of performance **(NOTE 2)** Shall be no loss of function Shall be no loss of stored data or user programmable functions
B	May show loss of function (one or more) May show degradation of performance **(NOTE 1)** No unintentional transmissions	Function shall be self-recoverable Shall operate as intended after recovering Shall be no degradation of performance **(NOTE 2)** Shall be no loss of stored data or user programmable functions
C	May be loss of function (one or more)	Functions shall be recoverable by the operator Shall operate as intended after recovering Shall be no degradation of performance **(NOTE 2)**

NOTE 1:

Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.

If the minimum performance level or the permissible performance degradation in not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect form the apparatus if used as intended.

NOTE 2:

No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed.

If the minimum performance level or the permissible performance degradation in not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect form the apparatus if used as intended.

ETSI EN 301 489-1

Performance criteria for Continuous phenomena applied Transmitters (CT)

If no further details are given in the relevant part of the present document dealing with the particular type of radio equipment, the following *general performance criteria for continuous phenomena* shall apply.

During and after the test:

The apparatus shall continue to operate as intended. No *degradation of performance* or *loss of function* is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intends. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the test:

The EUT shall not unintentionally transmit or change its actual operating state and stored data. If the *minimum performance level* or the *permissible loss* is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect form the apparatus if used as intended.

For ancillary equipment the pass/failure criteria supplied by the manufacturer (see subclause 6.4) shall apply, unless the ancillary equipment is tested in connection with a receiver or transmitter in which case the corresponding performance criteria above shall apply.

Performance criteria for Transient phenomena applied Transmitters (TT)

If no further details are given in the relevant part of the present document dealing with the particular type of radio equipment, the following *general performance* criteria for transient phenomena shall apply.

After the test:

The apparatus shall continue to operate as intended. No *degradation of performance* or *loss of function* is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intends. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the test:

The EMC exposure to an electromagnetic phenomenon, a *degradation of performance* is, however, allowed. No change of the actual mode of operation (e.g. unintended transmission) or stored data is allowed.

If the minimum performance level or the permissible loss is not specified by the manufacturer, Then either of these may be deduced from the product description and documentation and what the user may reasonably expect form the apparatus if used as intended.

For ancillary equipment the pass/failure criteria supplied by the manufacturer (see subclause 6.4) shall apply, unless the ancillary equipment is tested in connection with a receiver or transmitter in which case the corresponding performance criteria above shall apply.

Performance criteria for Continuous phenomena applied Receivers (CR)

If no further details are given in the relevant part of the present document dealing with the particular type of radio equipment, the following *general performance* criteria for continuous phenomena shall apply.

During and after the test:

The apparatus shall continue to operate as intended. No *degradation of performance* or *loss of function* is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intends. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the test:

The EUT shall not unintentionally transmit or change its actual operating state and stored data. If the minimum performance level or the permissible loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect form the apparatus if used as intended.

For ancillary equipment the pass/failure criteria supplied by the manufacturer (see subclause 6.4) shall apply, unless the ancillary equipment is tested in connection with a receiver or transmitter in which case the corresponding performance criteria above shall apply.

Performance criteria for Transient phenomena applied Receivers (TR)

If no further details are given in the relevant part of the present document dealing with the particular type of radio equipment, the following *general performance* criteria for transient phenomena shall apply.

After the test:

The apparatus shall continue to operate as intended. No *degradation of performance* or *loss of function* is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intends. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the test:

The EMC exposure to an electromagnetic phenomenon, a degradation of performance is, however, allowed. No change of the actual mode of operation (e.g. unintended transmission) or stored data is allowed.

If the minimum performance level or the permissible loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect form the apparatus if used as intended.

For ancillary equipment the pass/failure criteria supplied by the manufacturer (see subclause 6.4) shall apply, unless the ancillary equipment is tested in connection with a receiver or transmitter in which case the corresponding performance criteria above shall apply.

ETSI EN 301 489-17

Performance criteria for Continuous phenomena applied Transmitters (CT)

The performance criteria A shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied Transmitters (TT)

The performance criteria B shall apply, except for voltage dips of 100ms and voltage interruptions of 5000 ms duration, for which performance criteria C shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In system using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Continuous phenomena applied Receivers (CR)

The performance criteria A shall apply.

Where the EUT is a *transceiver*, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of test is correctly interpreted.

Performance criteria for Transient phenomena applied Receivers (TR)

The performance criteria B shall apply, except for voltage dips of 100ms and voltage interruptions of 5000 ms duration, for which performance criteria C shall apply.

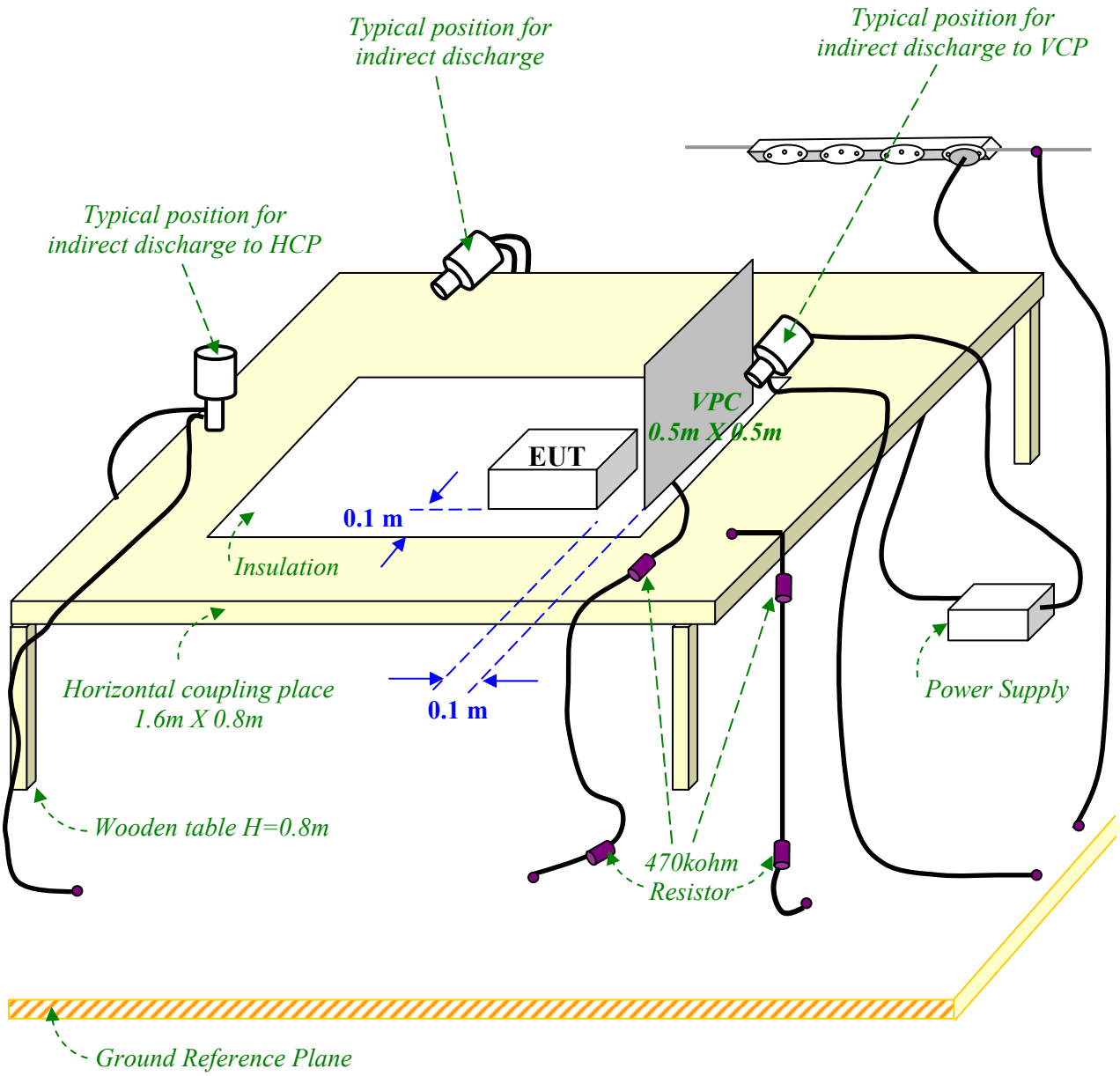
Where the EUT is a *transceiver*, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of test is correctly interpreted.

Chapter 4 Electrostatic Discharges Immunity Test

ESD Test information:

Test setup: Shielded room, According to EN 61000-4-2

Test setup for table-top equipment at laboratory tests:



Test levels: (Apply Level 2 and Level 3)

1a — Contact discharge		1b — Air discharge	
Level	Test voltage (kV)	Level	Test voltage (kV)
1	2	1	2
2	4	2	4
3	6	3	8
4	8	4	15
X	Special	X	Special
NOTE: "X" is an open level. The level has to be specified in the dedicated equipment specification. If higher voltages than those shown are specified, special test equipment may be needed.			

Test Voltage: ☒ 4KV contact discharge
☒ 8KV air discharge

Indirect Discharges: ☒ HCP
☒ VCP

Polarity: ☒ Positive
☒ Negative

Test mode: Ref. Test method of Chapter 1

Test points: Enclosure and Connectors of EUT.

Test instruments:

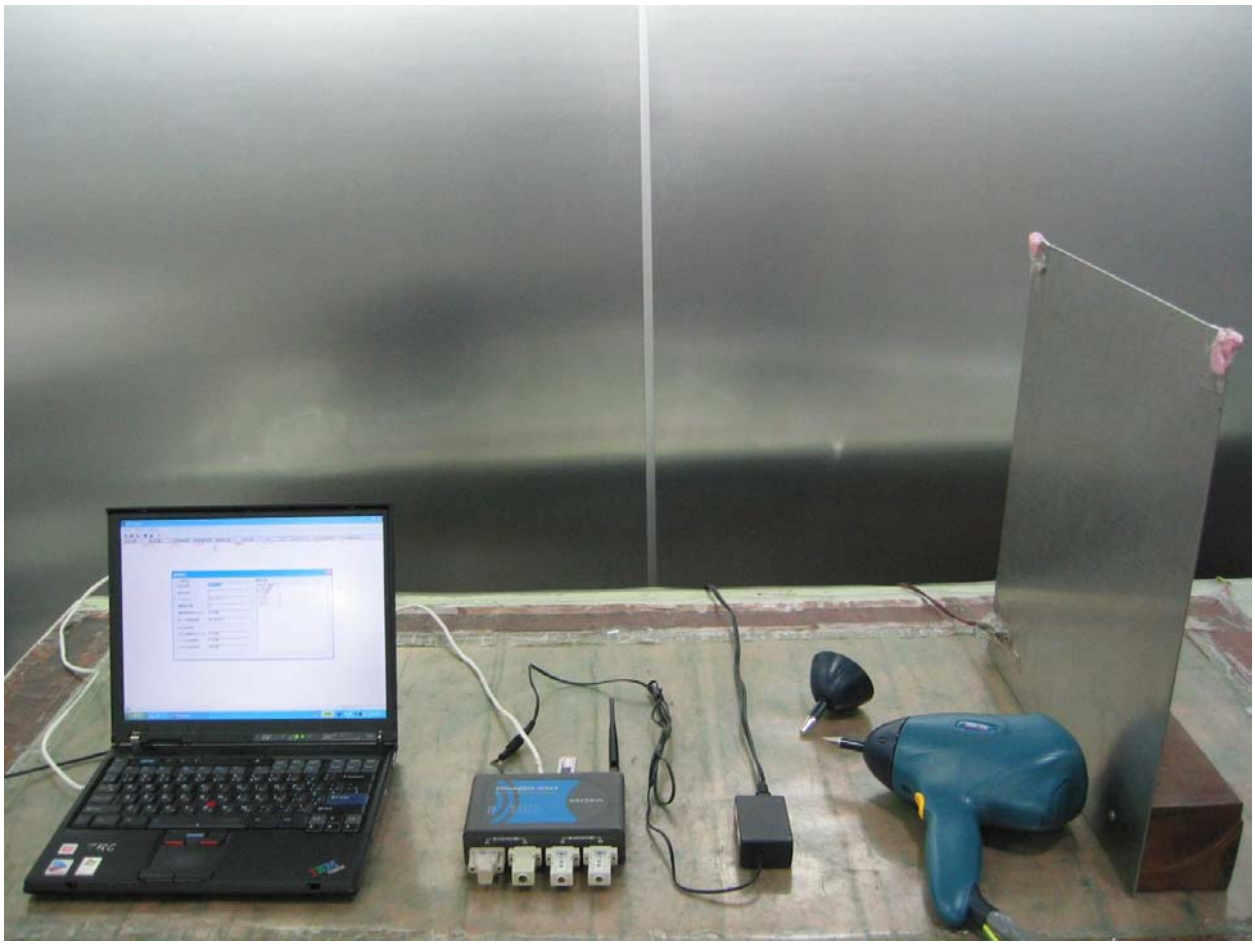
Name	Model Number	Serial Number	Selected
Best Plus BURST ESD SURGE TRANSIENTS	Best Plus V6.2	199749-019SC	
SCHAFFNER EMV AG	NSG 438 INA 4380	253	X
KeyTek Instrument ESD Test system	Series 2000	9204303/9204310 9209226/9301395	
NoiseKen Electrostatic Discharge Simulator	ESS-100L(A)	2100C03605	
NoiseKen Electrostatic Discharge Gun	TC-815P	2100C03566	

Comment:

Performance Criteria: **(According to ETSI EN 301 489-1)**

(X) Enclosure	( )CT	(X)TT	( ) CR	(X)TR
(X) Signal and control ports	( )CT	(X)TT	( ) CR	(X)TR

EN 61000-4-2 PHOTO OF TEST SET-UP

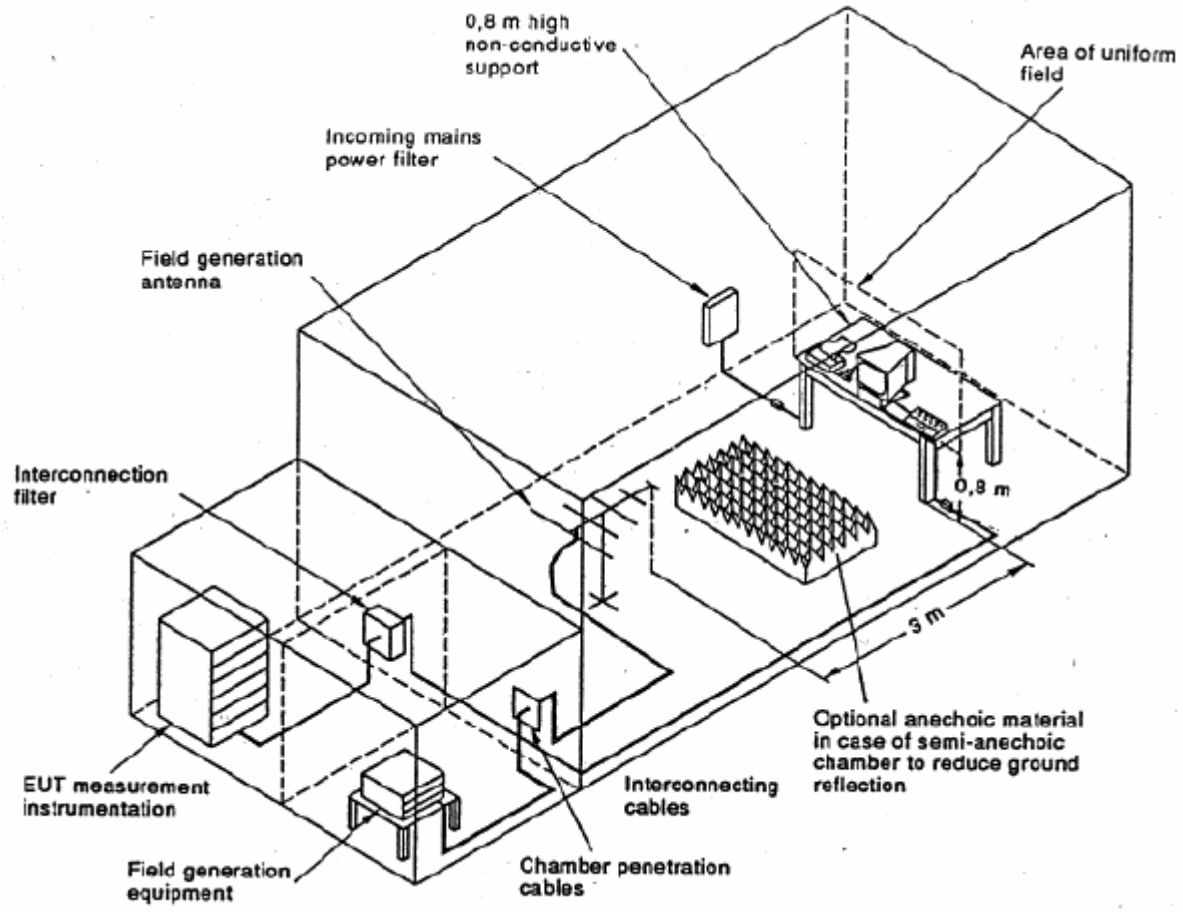


Chapter 5 Radio Frequency Immunity Test (RS)

RS Test information:

Test setup: Fully anechoic chamber

Radiated Immunity Test Setup



Test levels: **(Apply Level 2)**

Level	Test Field Strength (V/m)
1	1
2	3
3	10
X	Special
NOTE: the "X" is an open test level. This level may be given in the product specification.	

Field strength: (X) 3V/m at 80 ~ 1000 MHz
(X) 3V/m at 1400 ~ 2000 MHz
Modulation: ( ) FM %
(X) 80% AM Modulation with 1KHz
( ) 80% AM Modulation with 400Hz when signal is modulated at 1kHz
( ) 900 KHz±5 KHz with PM 200 Hz and 100% depth
Step size: (X) 1% step size
Sweep time: (X) 2.5 Second

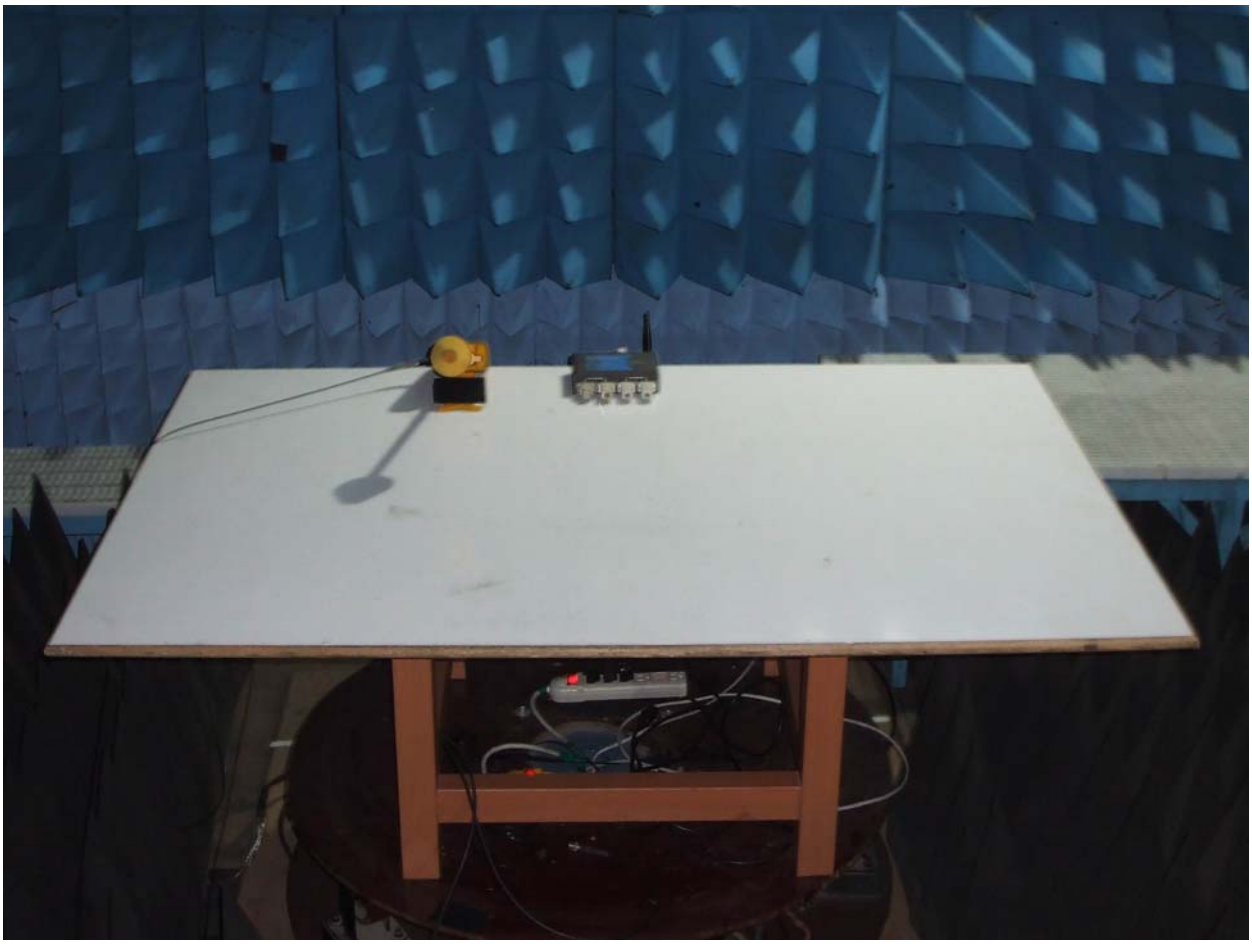
Test mode: Ref. Test method of Chapter 1

Test instruments:

Name	Model Number	Serial Number	Selected
Amplifier Research RF Amplifier (0.8 – 3GHz)	15S1G3	305899	X
Amplifier Research 40dB Attenuator	DC7144	305930	X
Mini-Circuits RF Amplifier (20 – 500MHz)	LZT-1	N/A	X
Mini-Circuits RF Amplifier (500 – 1GHz)	LZT-2	N/A	X
EMCO Bi-log Antenna	3141	9711-1075	X
TRC Horn Antenna	HA0501-05	RS-01	X
HP Signal Generator	8648D	3613A00117	X
HP Power Meter	E4418B	GB39291240	X
WG radiation meters	EMC-20	BN2244129	X
WG E-filed	2244 / 90.20	Z-0001	X
GW DC Power Supply	GPR-3520HD	A150114	X

Comment:
Performance Criteria: **(According to ETSI EN 301 489-1)**
(X) Enclosure (X)CT ( )TT (X) CR ( )TR

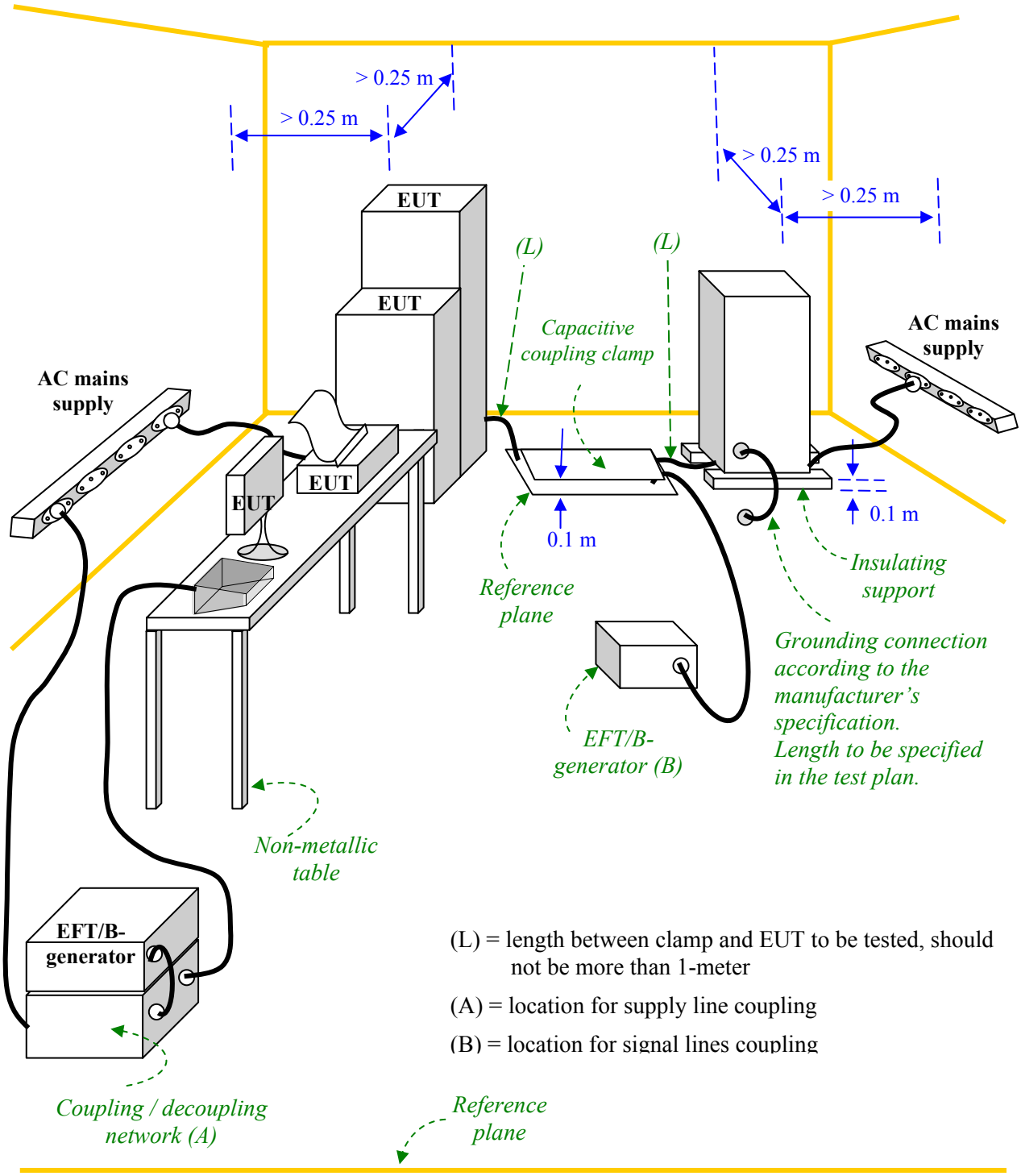
EN 61000-4-3 PHOTO OF TEST SET-UP



Chapter 6 Electric Fast Transient/Burst Requirements Test

EFT Test information:

General test set-up for laboratory type tests:



Test levels: **(Apply Level 2)**

Open-circuit output test voltage (±10%) and repetition rate of the impulses (±20%)				
Level	On power supply port, PE		On input/output signal, data and control ports	
	Voltage peak kV	Repetition rate kHz	Voltage peak kV	Repetition rate kHz
1	0.5	5	0.25	5
2	1	5	0.5	5
3	2	5	1	5
4	4	2.5	2	5
X	Special	Special	Special	Special
NOTE: the "X" is an open level. The level has to be specified in the dedicated equipment specification				

Test setup: According to EN 61000-4-4

Test Voltage:

DC Power line	☐	0.5 KV, 5 KH
AC Power line	☒	1 KV, 5 KHz
Signal & Control line	☒	0.5 KV, 5 KHz;
	☐	1 KV, 5 KHz

Polarity:

☒ Positive
☒ Negative

Test Duration:

☒ 1 minute
☐ 3 minutes

Connected lines:

☐ Power line shielded
☒ Power line non-shielded
☒ Signal & Control line non-shielded (RJ45)
☐ Signal & Control line shielded

Test mode: Ref. Test method of Chapter 1.

Test instrument:

Name	Model Number	Serial Number	Selected
Best Plus BURST ESD SURGE TRANSIENTS	Best Plus V6.2	199749-019SC	
BEST EMC Test Instrument	BEST EMC V2.3 (-8, -9)	199918-006SC	
KeyTek Instrument EFT Test system	E412	9505206/505207	X

Comment:

Performance Criteria: **(According to ETSI EN 301 489-1)**

(X) Signal and control ports	( )CT	(X)TT	( ) CR	(X)TR
( ) DC power input ports	( )CT	( )TT	( ) CR	( )TR
(X) AC mains input ports	( )CT	(X)TT	( ) CR	(X)TR

EN 61000-4-4 PHOTO OF TEST SET-UP

Chapter 7 Surge Immunity Test

Surge Test information:

Test setup: According to *EN 61000-4-5*

Test levels: **(Apply Level 2 and Level 3)**

Level	Test Field Strength (kV)
1	0.5
2	1.0
3	2.0
4	4.0
X	Special
NOTE: the "X" is an open class. This level may be specified in the product specification.	

Test Voltage:

DC Power line	☐	0.5 KV
AC Power line	☒	Line – Line: 1KV
	☒	Line – Ground: 2KV
	☐	Line – Line: 0.5KV
	☐	Line – Ground: 1KV
Control line	☐	0.5 KV
Signal	☐	1 KV,
	☒	0.5KV

Time:

☒ 1.2/50μs [Voltage waveform]

☒ 8/20μs [Current waveform]

Polarity:

☒ Positive

☒ Negative

Connected lines:

☐ Power line shielded

☒ Power line non-shielded

☒ Signal & Control line non-shielded

☐ Signal & Control line shielded

Test mode: Ref. Test method of Chapter 1.

Test instrument:

Name	Model Number	Serial Number	Selected
Best Plus BURST ESD SURGE TRANSIENTS	Best Plus V6.2	199749-019SC	
BEST EMC Test Instrument	BEST EMC V2.3 (-8, -9)	199918-006SC	
KeyTek Pulsed-EMI Test System	E103, E501B, E502B, E503, E505A, E4552A	0008260 ~0008264, 0008254	X

Comment:

Performance Criteria: **(According to ETSI EN 301 489-1)**

(X) AC mains input ports	( )CT	(X)TT	( ) CR	(X)TR
(X) Signal and control ports	( )CT	(X)TT	( ) CR	(X)TR

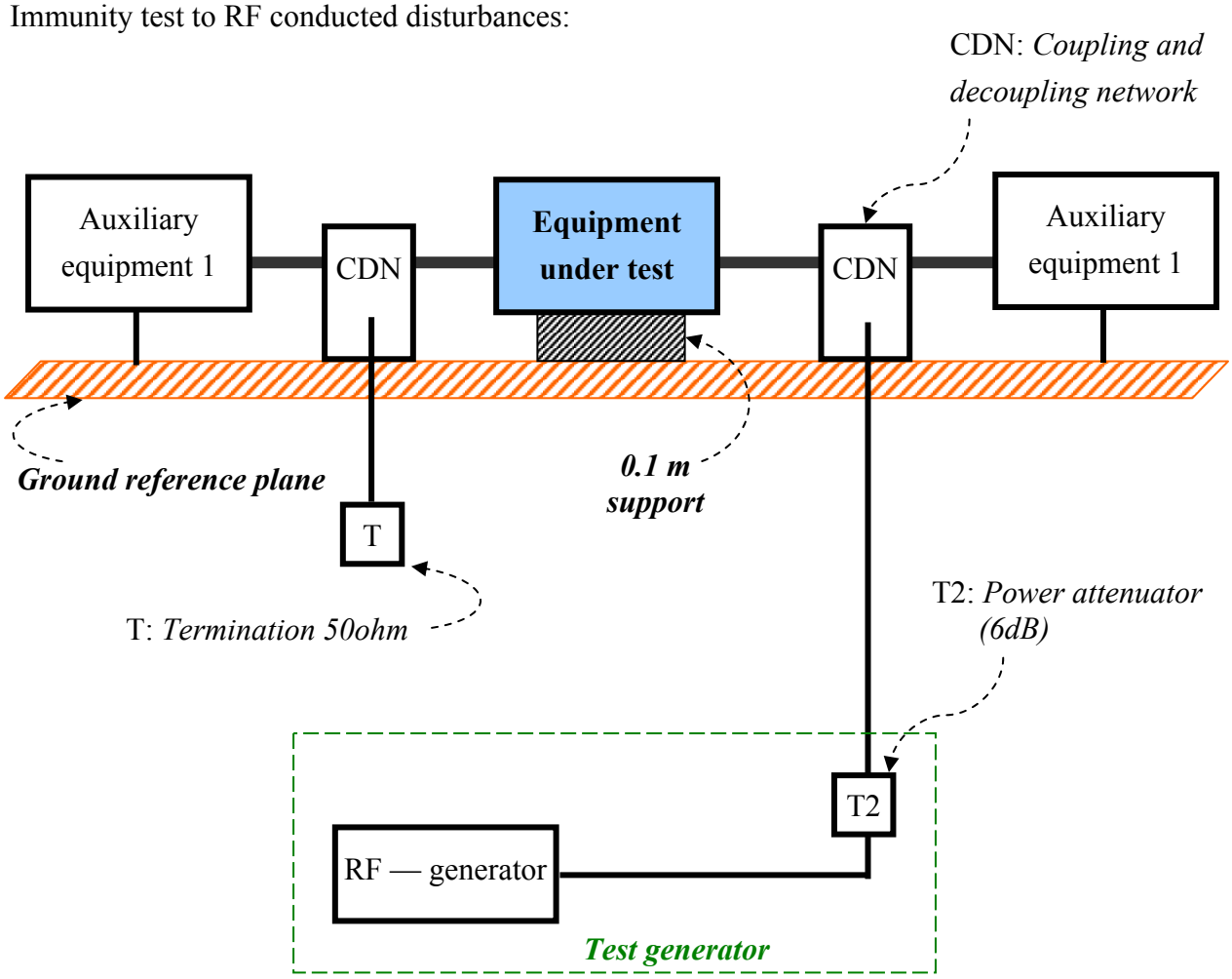
EN 61000-4-5 PHOTO OF TEST SET-UP

Chapter 8 Continuous Wave Voltage Immunity Test

CS Test information:

Test setup: According to EN 61000-4-6

Immunity test to RF conducted disturbances:



Test levels: **(Apply Level 2)**

Frequency range 150kHz to 80MHz		
Level	Voltage level (e.m.f.)	
	Uo [dB(μv)]	*Uo* [V]
1	120	1
2	130	3
3	140	10
X	Special	
NOTE: the "X" is an open test level.		

Test Frequency: ☒ 0.15 ~ 80MHz

Modulation:
- ☐ FM %
- ☒ 80% AM Modulation with 1kHz
- ☐ 80% AM Modulation with 400Hz when signal is modulated at 1kHz
- ☐ 900 MHz±5 MHz with PM 200 Hz and 50% duty cycle

Step size:
- ☐ Performed over the frequency range 150kHz to 80MHz with the exception of an exclusion band for transmitters, and for receivers and duplex transceivers
- ☒ For receivers and transmitters the stepped frequency increments shall be 1% frequency increment of the momentary frequency in the frequency range 150kHz to 80MHz, unless specified otherwise in the part of EN 301 489 dealing with the particular type of radio equipment

Field strength:
- ☐ 1Vrms
- ☒ 3Vrms
- ☐ 10Vrms

Connected lines:
- ☐ Power line shielded
- ☒ Power line non-shielded
- ☒ Signal & Control line non-shielded
- ☐ Signal & Control line shielded

Test mode: Ref. Test method of Chapter 1

Test instruments:

Name	Model Number	Serial Number	Selected
FRANKONIA EMV–Mess–System	CIT-10	103A3113	X
FRANKONIA CDN	M2+M3	A3011015	X
FRANKONIA CDN	T2-801	A3010002	
FRANKONIA CDN	T4-801	A3015004	X
FRANKONIA CDN	S1-801	A3005002	
SCHAFFNER FM-Koppelzange	KEMZ 801	17045	
SCHAFFNER RF-SYNTHE SIZERIAMP21FIER	NSG 2070-1	1020	
SCHAFFNER CDN	M325	13773	
SCHAFFNER CDN	M216	15604	
SCHAFFNER CDN	T004	15230	
SCHAFFNER CDN	S501	15167	
SCHAFFNER FM-Koppelzange	KEMZ 801	14301	
HP Transmission Test Set	4935A	3115A24046	
B & K Precision Sound Level Meter	Type 2232	1810564	

Comment:

Performance Criteria: *(According to ETSI EN 301 489-1)*

( ) Antenna port	( )CT	( )TT	( ) CR	( )TR
(X) Signal and control ports	(X)CT	( )TT	(X) CR	( )TR
( ) DC power input ports	( )CT	( )TT	( ) CR	( )TR
(X) AC mains input ports	(X)CT	( )TT	(X) CR	( )TR

EN 61000-4-6 PHOTO OF TEST SET-UP

Chapter 9 Voltage DIP / Interruption Test

DIP Test information:

Test setup: According to *EN 61000-4-11*

Voltage dips: ☒ 30%, 0.01 Second
☒ 60%, 0.1 Second

Voltage interruptions: ☒ > 95%, 5 Seconds

Test mode: Ref. Test method of Chapter 1

Test instruments:

Name	Model Number	Serial Number	Selected
Best Plus BURST ESD SURGE TRANSIENTS	Best Plus V6.2	199749-019SC	
BEST EMC Test Instrument	BEST EMC V2.3 (-8, -9)	199918-006SC	
Partner EMS Tester	Transienter-1000	PIO	X

Comment:

Performance Criteria: (According to ETSI EN 301 489-1)

Dips 30%:	(X) CT	( ) TT	(X) CR	( ) TR
Dips 60%:	( ) CT	( ) TT	( ) CR	( ) TR
Interruptions >95%:	( ) CT	( ) TT	( ) CR	( ) TR

No unintentional responses shall occur at the end of the test;

( )Event of loss of function(s) ( )Event of loss of user stored data

Performance Criteria: (According to ETSI EN 301 489-17)

Dips 60%, 100 ms :	( ) A	( ) B	(X) C
Interruptions >95%, 5 000 ms:	( ) A	( ) B	(X) C

EN 61000-4-11 PHOTO OF TEST SET-UP

Chapter 10 Harmonics Test

Test information:

Test setup: According to EN 61000-3-2

Test item: Quasi – stationary & Fluctuating Current Harmonics Test.

Test mode: Ref. Test method of Chapter 1

Test instrument:

Name	Model Number	Serial Number
Harmonic/ Flicker Test System	HP 6842A	3531A-00102

Test Equipment Settings:	Quasi-stationary Current Harmonics Test	Fluctuating Current Harmonics Test
Line Voltage	230VAC	230VAC
Line Frequency	50Hz	50Hz
Device Class	D	D
Test Limit Overrides	None	None
Total Number of Failures:	None	None
Total Number of Errors:	None	None

Test Result: Pass

Chapter 11 Voltage Fluctuation and Flicker Test

Test information:

Test setup: According to *EN 61000-3-3*

Test mode: Ref. Test method of Chapter 1

Test instrument:

Name	Model Number	Serial Number	Selected
Harmonic/Flicker Test System	HP 6842A	3531A-00102	X

Test Equipment Settings:

Line Voltage	230VAC
Line Frequency	50Hz
Test Limit Overrides	None
Total Number of Failures:	Pst: (0), Plt: (0)
	Dc: (0), Dmax (0), Dt (0)
Total Number of Errors:	None

Test Result: Pass

Chapter 12 Conducted Emission Test

Test condition and setup

All the equipment is placed and setup according to *EN 55022*.

(1) Mains power:

The EUT is assembled on a wooden table, which is 80 cm high and placed 40 cm from the back-wall, which is a vertical conducting plane. One LISN is for EUT, the other LISN is for support equipment. They are all placed on the conductive ground. The EUT's LISN connect a line switch box for selecting L1 or L2, then connect to a preamplifier and spectrum.

(2) Telecommunication port:

The EUT is place as mains disturbance test. The communication line connected to ISN and then the measuring receiver connected to the ISN to measured the level of voltage disturbance.

The spectrum scans from 150KHz to 30MHz. Conducted emission levels are detected at *maximum peak mode*. But if the maximum peak mode failed or over *average limit*, it will be measured by *average detection mode*.

While testing the worst-emission plot printed in the *peak detection mode*, and there are up to 6 highest emissions to be recorded. The plot is kept as the original data and not included in the test report.

List of test Instrument

alibration Date

Instrument Name	Model	Brand	Serial No.	Next time
Receiver	SCR3102	SCHAFFNER	012	12/08/07
LISN (EUT)	3825/2	EMCO	9411-2284	08/18/07
LISN (Support E.)	3825/2	EMCO	9210-2007	08/18/07
Pre-amplifier	CB-001	TRC	98-02	05/28/07
Line Switch Box	CB-01	TRC	98-04	05/28/07
FTB-1-6 Attenuator	15542	Mini – Circuits	9620 03	05/28/07
20dB Attenuator	CAT-20	Mini – Circuits	9620 13	05/28/07
Coaxial Cable	BNC3200B-0058	JYEBAO	CL-05	05/28/07
Coaxial Cable	BNC31VB-0316	JYEBAO	IF-01CA006 9-036	05/28/07
50 Ohm Terminator	370BNM	NARDA	PWR5W	07/20/07
50 Ohm Terminator	370BNM	NARDA	PWR5W	07/20/07
50 Ohm Terminator	370BNM	NARDA	PWR5W	12/02/07
50 Ohm Terminator	370BNM	NARDA	PWR5W	12/02/07
ISN	ISN T400	Schaffner	19104	07/07/07
Current Probe	9208-1	Solar Electronics Co.	0411601	07/12/07

The level of confidence of 95%, the uncertainty of measurement of conducted emission is +3.10dB / -4.84dB.

Conducted Test Placement (Front view and Side view)

Test Result of Conducted Emissions for Mains Power

Testing room : Temperature : 25 ° C Humidity : 73 % RH

Line 1

Frequency (kHz)	*READING AMPLITUDE*			*LIMIT*		*Margin (dB)*
	Peak (dBμV)	*Quasi-Peak (dBμV)*	*Average (dBμV)*	*Quasi-Peak (dBμV)*	*Average (dBμV)*	
172.000	58.19	---	---	79.00	66.00	-7.81
279.000	55.07	---	---	79.00	66.00	-10.93
472.000	51.92	---	---	79.00	66.00	-14.08
724.000	45.30	---	---	73.00	60.00	-14.70
1186.000	38.38	---	---	73.00	60.00	-21.62
7392.000	41.30	---	---	73.00	60.00	-18.70
10600.000	40.25	---	---	73.00	60.00	-19.75
17700.000	36.24	---	---	73.00	60.00	-23.76
25300.000	20.66	---	---	73.00	60.00	-39.34

Line 2

Frequency (kHz)	*READING AMPLITUDE*			*LIMIT*		*Margin (dB)*
	Peak (dBμV)	*Quasi-Peak (dBμV)*	*Average (dBμV)*	*Quasi-Peak (dBμV)*	*Average (dBμV)*	
150.000	57.58	---	---	79.00	66.00	-8.42
198.000	55.41	---	---	79.00	66.00	-10.59
331.000	51.68	---	---	79.00	66.00	-14.32
605.000	43.65	---	---	73.00	60.00	-16.35
1567.000	26.94	---	---	73.00	60.00	-33.06
4896.000	25.57	---	---	73.00	60.00	-34.43
7392.000	41.53	---	---	73.00	60.00	-18.47
10760.000	40.77	---	---	73.00	60.00	-19.23
17700.000	36.05	---	---	73.00	60.00	-23.95
25300.000	24.69	---	---	73.00	60.00	-35.31

Note:

1. The reading amplitudes are all under limit.
2. Testing result = Amplitude reading + Correction factor (Insertion loss of LISN, Cable loss, Attenuator, Amplifier and so on)

Chapter 13 Radiated Emission Test

Test condition and setup

Pretest:

Prior to the final test (OATS test), the EUT is placed in a shielded enclosure, and scan from 30MHz to 1GHz. This is done to ensure the radiation is exactly emitted from the EUT.

Final test:

Final radiation measurements are made on a **10 – meter,** open-field test site. The EUT is placed on a nonconductive table, which is 0.8m height, the top surface is 1.0 x 1.5 meter. The entire placement is according to *EN 55022*.

The whole range antenna is used to measure frequency from 30 MHz to 1GHz. The final test is used the spectrum analyzer (EMI Receiver). Measure more than six top marked frequencies generated form pretest by computer step by step at each frequency.

The EUT is rotated 360 degrees, and antenna is raised and lowered from 1 to 4 meters to find the maximum emission levels. The antenna is used with both horizontal and vertical polarization.

Appropriated preamplifier which is made by TRC is used for improving sensitivity and precautions is taken to avoid overloading .The spectrum analyzer's 6dB bandwidth is set to 120 kHz, and the EUT is measured at quasi-peak (below 1GHz) mode.

If the emission is close to the frequency band of ambient, the tester will recheck the data and the corrected data will be written in the test data sheet. If the emission is just within the ambient, the data from shielded room will be taken as the final data.

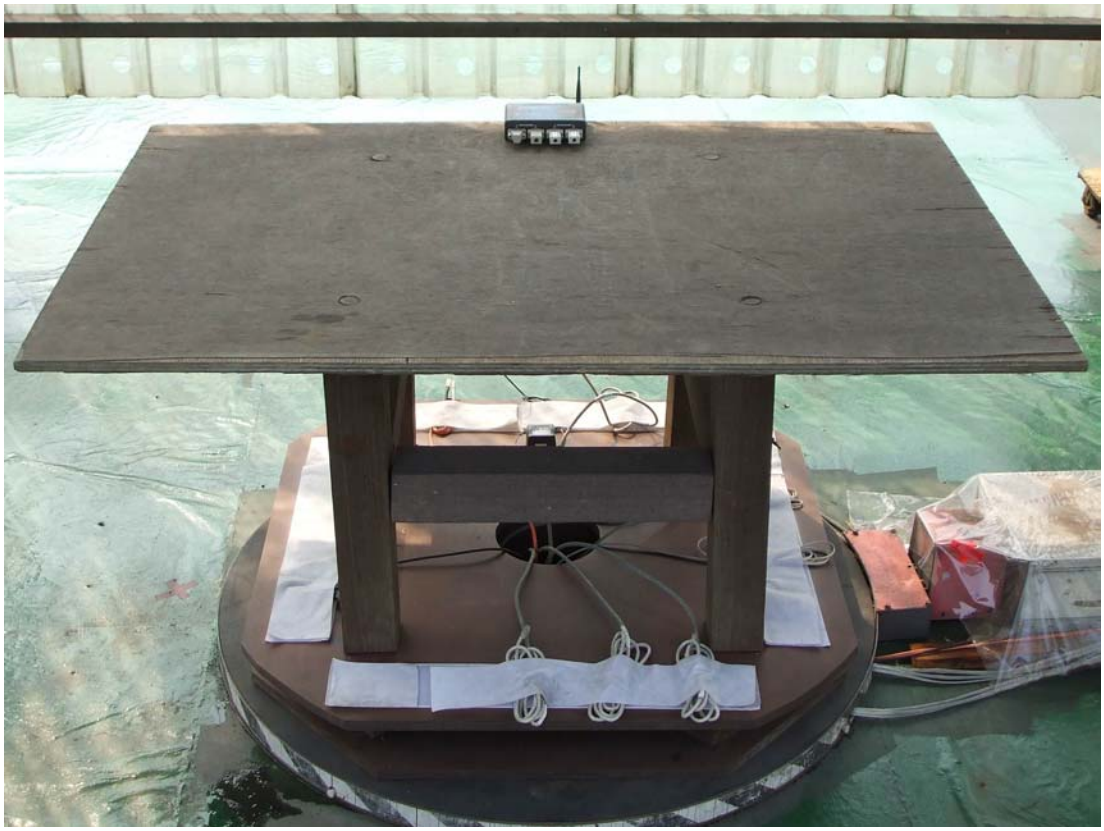
List of test Instrument

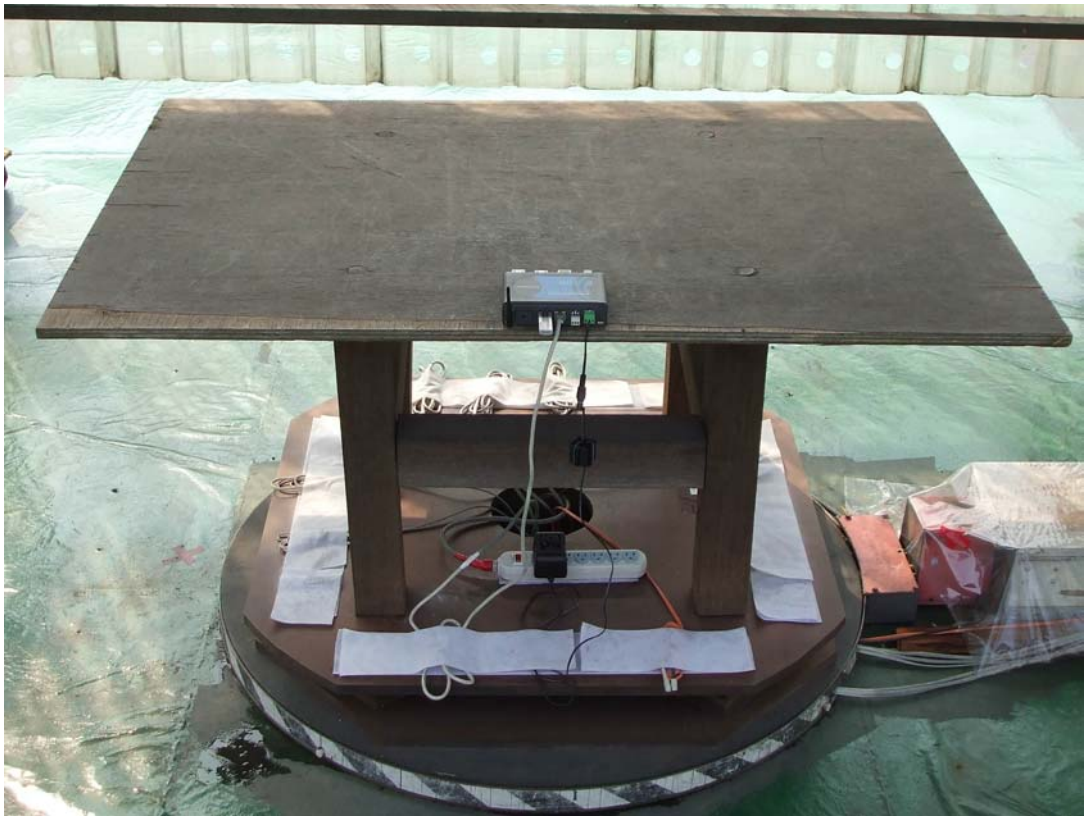
Calibration Date

Instrument Name	Model	Brand	Serial No.	Next time
EMI Receiver	8546A	HP	3520A00242	09/06/07
RF Filter Section	85460A	HP	3448A00217	09/06/07
Small Biconical Antenna	UBAA9114 & BBVU9135	SCHWARZECK	127	12/07/07
Pre-amplifier	PA1F	TRC	1FAC	05/20/07
Auto Switch Box (>30MHz)	ASB-01	TRC	9904-01	05/20/07
Coaxial Cable (Double shielded, 15 meter)	A30A30-0058-50FS-15M	JYEBAO	SMA-08	05/20/07
Coaxial Cable (1.1 meter)	A30A30-0058-50FS-1M	JYEBAO	SMA-02	05/20/07
Receiver	SCR3102	SCHAFFNER	012	05/20/07
Control Box	TWR95-4	TRC	C9001-2	11/28/07
Antenna	VULB 9160	SCHWARZECK	3063	05/31/07
Pre-amplifier	TRC-CB-2	TRC	CB-002	N/A
Coaxial cable (20 meter)	RG-214/U	JYEBAO	Cl-002	05/31/07
Coaxial Cable (50 cm)	BNC31VB-0316	JYEBAO	SMA-02	05/28/07
Coaxial Cable (1.1 meter)	BNC31VB-0318	JYEBAO	SMA-02	05/28/07
Coaxial Cable (1.1 meter)	BNC31VB-0316	JYEBAO	SMA-02	05/28/07
Coaxial Cable (1.1 meter)	BNC31VB-0316	JYEBAO	SMA-02	05/28/07

The level of confidence of 95% , the uncertainty of measurement of radiated emission is +2.85dB / -2.77dB .

Radiated Test Placement (Front view and Rear view)





Test Result of Spurious Radiated Emissions

Test Conditions:

Testing room : Temperature : 25 ° C Humidity : 73 % RH

Testing site : Temperature : 33 ° C Humidity : 62 % RH

Radiated Emissions of 30MHz to 1GHz [Horizontal]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*Class B (10 m)*	
Frequency (MHz)	*Amplitude (dBμV)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBμV/m)*	*Limit (dBμV/m)*	*Margin (dB)*
146.3200	35.47	1.00	328	-4.68	30.79	40.00	-9.21
250.0070	46.53	3.97	79	-4.95	41.58	47.00	-5.42
288.0180	45.31	3.98	39	-3.38	41.93	47.00	-5.07
669.2460	33.98	3.01	159	6.67	40.65	47.00	-6.35

Radiated Emissions of 30MHz to 1GHz [Vertical]]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*Class B (10 m)*	
Frequency (MHz)	*Amplitude (dBμV)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBμV/m)*	*Limit (dBμV/m)*	*Margin (dB)*
146.3240	41.03	3.83	258	-4.68	36.35	40.00	-3.65
250.0070	44.73	1.15	0	-4.95	39.78	47.00	-7.22
288.0180	44.41	1.00	73	-3.38	41.03	47.00	-5.97
500.0040	35.63	1.00	89	2.91	38.54	47.00	-8.46
669.2440	35.74	2.55	0	6.67	42.41	47.00	-4.59

Note:

1. Margin = Amplitude – limit, *if margin is minus means under limit.*
2. Corrected Amplitude = Reading Amplitude + Correction Factors
3. Correction factor = Antenna factor + (Cable Loss – Amplitude gain) + Switching Box Loss

EN 50392:2004 —Measurement of Maximum Permissible Exposure

1. Foreword

This standard is limited to apparatus which is intended for use by the general public as defined in the Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (Official Journal L 199 of 30 July 1999).

This generic standard applies to electronic and electrical apparatus for which no dedicated product- or product family standard regarding human exposure to electromagnetic fields applies.

This generic standard does not cover equipment, which fulfils the requirements given in EN 50371 or is medical equipment as defined in the Council directive 93/42/EEC of 14 June 1993 concerning medical devices.

The frequency range covered is 0 Hz to 300 GHz.

The object of this standard is to demonstrate the compliance of such apparatus with the basic restrictions or reference levels on exposure of the general public related to electric, magnetic, electromagnetic fields and induced and contact current.

The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

2. Description of EUT

Applicant	**:** Moxa Technologies Co., Ltd.
Product name	**:** RISC-based Ready-to-Run Wireless Embedded Computer
Model	**:** ThinkCore W341-LX
Classification	**:** Mobile Device (i) Under normal use condition, the antenna is at least 20cm away from the user; (ii) Warning statement for keeping 20cm separation distance and the prohibition of operating next to the person has been printed in the user's manual
Frequency Range	**:** 2.400GHz ~ 2.4835GHz/5.150GHz ~ 5.250GHz
Operating Frequency	**:** 2.412GHz ~ 2.472GHz/5.180GHz ~ 5.240GHz
Supported Channel	**:** 13 Channels/4 Channels
Modulation Skill	**:** DBPSK, DQPSK, CCK, OFDM
Power Type	**:** Powered by the switching adapter, Manufacture: BALANCE ELECTRONICS CO., LTD. Model: GPSA-1200125 I/P: 100 ~ 240VAC ~ 50/60Hz 0.5A O/P: 12VDC 1.2A. Primary: 182cm length, non-shielded, without ferrite core Secondary: 186cm length, non-shielded, without ferrite core

Prepared by: *Jack Tsai* **Approved by:** *Frank Tsai*

3. Limits

According to EN 50392:2004, the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified 1999/519/EC.

Reference levels for electric, magnetic and electromagnetic fields

(0 Hz to 300 GHz, unperturbed rms values)

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density S_{eq} (W/m²)
-1 Hz	—	$3{,}2 \times 10^4$	4×10^4	—
-8 Hz	10 000	$3{,}2 \times 10^4/f^2$	$4 \times 10^4/f^2$	—
-25 Hz	10 000	$4\,000/f$	$5\,000/f$	—
025-0,8 kHz	$250/f$	$4/f$	$5/f$	—
8-3 kHz	$250/f$	5	6,25	—
-150 kHz	87	5	6,25	—
15-1 MHz	87	$0{,}73/f$	$0{,}92/f$	—
-10 MHz	$87/f^{1/2}$	$0{,}73/f$	$0{,}92/f$	—
)-400 MHz	28	0,073	0,092	2
00-2 000 MHz	$1{,}375\ f^{1/2}$	$0{,}0037\ f^{1/2}$	$0{,}0046\ f^{1/2}$	$f/200$
-300 GHz	61	0,16	0,20	10

According to **EN 50392:2004**, **Equation for Predicting RF Fields:**

Far Field Calculation Formula

$$E = \eta_o H = \frac{\sqrt{30PG(\theta,\phi)}}{r}$$

G = antenna gain relative to an isotropic antenna
θ,ϕ = elevation and azimuth angles to point of investigation
r = distance from observation point to the antenna
η_o = Characteristic impedance of free space

4. Calculated Results:

Test Mode	Channel Frequency (MHz)	Output Power (dBm)	Output Power (mW)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)
IEEE 802.11b	2442	18.324	67.98	7.14	61
IEEE 802.11g	2442	15.405	34.71	5.10	61
IEEE 802.11a	5180	15.104	32.39	4.92	61

Copy of the R&TTE Declaration of Conformity (DoC)

Declaration of Conformity

We, the under signed,

Company	Moxa Technologies Co., Ltd.
Address, City	Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City,
Country	Taipei, Taiwan, R.O.C.
Phone number	886-2-8919-1230
Fax number	886-2-8919-1231
E-mail	Jack_Shi@moxa.com.tw

certify and declare under our sole responsibility that the following equipment:

Product Description / Supplementary Info	RISC-based Ready-to-Run Wireless Embedded Computer
Manufacturer	Moxa Technologies Co., Ltd.
Brand	Moxa
Type	ThinkCore W341-LX

is tested to and conforms with the essential radio test suites included in the following standards:

Standard	**Issue date**
ETSI EN 300 328	V1.6.1 Nov. 2004
ETSI EN 301 893	V1.3.1 Aug. 2005
ETSI EN 301 489-1	V1.5.1 Nov. 2004
ETSI EN 301 489-17	V1.2.1 Apr. 2002
EN 60950-1	2001+A11: 2004
EN 50392	2004

and therefore complies with the essential requirements and provisions of the **R&TTE directive 1999/5/EC** of the European Parliament and of the council of 9March 1999 on radio equipment and Telecommunications Terminal Equipment and the mutual recognition of their conformity and the requirements of Annex III (conformity Assessment procedure referred to in article 10(4)).

The technical documentation as required by the Conformity Assessment procedure is kept at the following address:

Company	Moxa Technologies Co., Ltd.
Address, City	Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City,
Country	Taipei, Taiwan, R.O.C.
Phone number	886-2-8919-1230
Fax number	886-2-8919-1231
E-mail	Jack_Shi@moxa.com.tw

CE !

Draw up in	Taiwan
Date	2007/05/24
	Moxa Technologies Co., Ltd. Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C.
Signature & company stamp	Jackie Shi / Manager

Product Quality
Assurance Documents

Declaration of Product Quality Assurance

In accordance with the Conformity Assessment procedure referred to in article 10(3) of R&TTE Directive 1999/5/EC of the European Parliament and the council of 9 march 1999 on the Radio equipment and Telecommunication Terminal Equipment and their mutual recognition of their conformity (R&TTE directive) the following manufacture:

Company	Moxa Technologies Co., Ltd.
Address, City	Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City,
Country	Taipei, Taiwan, R.O.C.
Phone number	886-2-8919-1230
Fax number	886-2-8919-1231
E-mail	Jack_Shi@moxa.com.tw

declares under its sole responsibility that it had taken the following measures in order to achieve that the manufacturing process ensures compliance of the manufactured products with the technical documentation as established by *Moxa Technologies Co., Ltd..* under the requirements of the R&TTE directive and with the requirements of R&TTE directive that apply to them:

Number	**Measures taken in order to achieve that the manufacturing process ensures compliance of the manufactured products**
01	Manufacturing of the equipment is subcontracted by *Moxa Technologies Co.* to Moxa Technologies Co., Ltd., located at Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C., who is ISO 9002 certified for production and distribution of radio products. (See copy of ISO 9002 certification attached)

CE !

Draw up in	Taiwan
Date	2007/05/24
	Moxa Technologies Co., Ltd. Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C.
Signature & company stamp	Jackie Shi / Manager